# EMS **MATERIALS SCIENCE & METROLOGY CATALOG**

2019-20 EDITION

**LAPPING & POLISHING EQUIPMENT & SUPPLIES,** WAFER CLEAVING SYSTEMS & TOOLS, **HOLDERS, MOUNTS, & SUPPLIES FOR ATM, SEM, TEM, & FIB,** MOUNTING, EMBEDDING, & SECTIONING SUPPLIES, **VACUUM EQUIPMENT & ACCESSORIES,** CALIBRATION STANDARDS & SPECIMENS, MICRO & MINI TOOLS, **AND MORE...**

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Introduction to Microscopy Techniques
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Materials Ultramicrotomy
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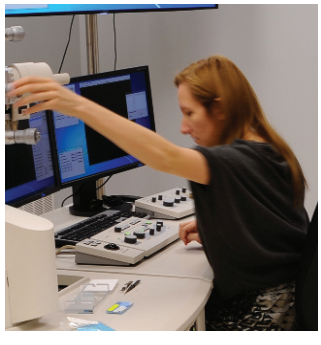

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# EMS **MATERIALS SCIENCE & METROLOGY CATALOG**

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TABLE OF CONTENTS



continued...

## NEW PRODUCTS...

### NEW! LatticeAx™ 225

*Accurate Indent and Cleaving System*

The addition of high magnification imaging enables accurate indenting, resulting in samples cleaved with high accuracy. The LatticeAx™ 225 delivers 20µm accuracy with high quality cleaved surfaces in 5 min. It integrates the patent pending LatticeAx™ base with an industrial platform customized for indenting and cleaving.

**See pages 120–123.**


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# EMS **MATERIALS SCIENCE & METROLOGY CATALOG**

## NEW PRODUCTS...


### The NEW EMS Plus Series of Sputter Coaters & Evaporators

The EMS Plus Series is the latest version of our internationally acclaimed, market-leading range of coaters, which offer sputter and evaporation coating combined in one easy to use platform.

They are increasingly used in high-resolution microscopy, where ultra-fine coating is a must.

The Plus Series provides users with a versatile, effective and affordable choice of rotary or turbomolecular pumped coaters.

**See pages 174–195.**

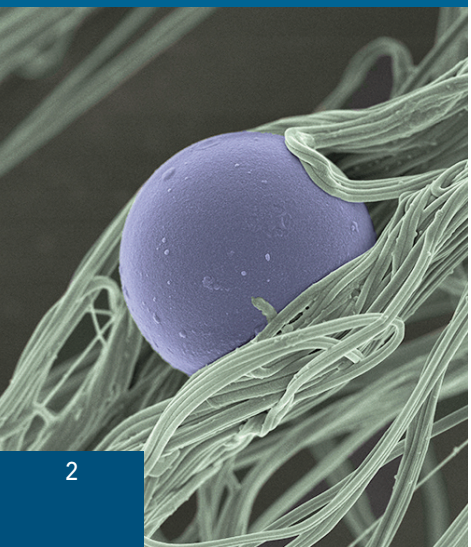

TABLE OF CONTENTS, (continued)

# SAMPLE PREPARATION & SUPPLIES

**COLD AND HOT MOUNTING MEDIA AND MOLDS,** ADHESIVES & MOUNTANTS, **MEMBRANE BOXES & CARRIER BOXES,** REPLICATION MATERIALS, **POLISHING AND LAPPING SUPPLIES,** DIAMOND COMPOUNDS, **GRINDING & SECTIONING SUPPLIES,** WAFERING BLADES


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# SAMPLE PREPARATION & SUPPLIES

## Cold and Hot Mounting Media and Molds

**EMS introduces a selective range of embedding and mounting medium on the market for both HOT MOUNTING and COLD MOUNTING – for literally all kinds of material specimens.**

### Hot Mounting

When preparation requirements include less expensive, uniform size and shape, and short processing times, hot mounting (hot compression mounting) is ideal.

Hot mounting takes place under pressure in a mounting press, where the specimen is placed in a cylinder together with the appropriate mounting resin. A temperature of up to 200°C, and a pressure of up to 50kN are then applied during the embedding of the specimen. There are two types of hot mounting processes: thermoplastic resins and thermo-setting resins.

Thermoplastic Resins melt when heated, offering the opportunity of repeating the process with the same specimen if the result is not satisfactory the first time. Thermoplastic resins harden during a chemical reaction with or without pressure. That means high pressure is not necessary during heating and cooling. This process is good when mounting fragile specimens.

Thermo-setting Resins cure at elevated temperatures under pressure. Thermo-setting resins cannot be re-melted after mounting.

### CHOOSING A HOT MOUNT*

| | Cat # | Resin | Material | Type | Shrinkage 1-3 (Best=1) | Hardness 1-3 (Softest=1) | Applications/ Specific Properties |
|---|---|---|---|---|---|---|---|
|  | **1210** | Black/ Gray | Acryl with iron filler | Thermoplastic | • • | • | Electrolytic polishing. |
|  | **1211** | Gray | Acryl with Aluminum filler | Thermoplastic | • • | • • | For soft materials.** Fast mounting also when used as backing. |
|  | **1212** | Clear | Acryl | Thermoplastic | • • | • • | Transparent mounts. Porous specimens.*** Surface electrical insulator for ConduFast. |
|  | **1213** | Black | Epoxy with mineral filler | Thermosetting | • | • • • | For hard materials. Excellent edge retention. |
|  | **1214** | Green | Bakelite with wood filler | Thermosetting | • • • | • • • | Routine examination of soft to medium hard materials. Suitable as backing. |
|  | **1215** | Light Yellow | Melamine mineral and glass filler | Thermosetting | • | • • • | For soft to medium hard materials. Excellent edge retention. |
|  | **1216** | Black | Bakelite with carbon filler | Thermosetting | • | • • | SEM examination. |
|  | **1217** | Black | Bakelite with wood filler | Thermosetting | • • • | • • • | Routine examination of soft to medium hard materials. Suitable as backing. |
|  | **1218** | Red | Bakelite with wood filler | Thermosetting | • • • | • • • | Routine examination of soft to medium hard materials. Suitable as backing. |

* 30 mm dia. mount with a 45% carbon steel specimen (20 vol%) ** Embedded abrasives can occur in the aluminum filler *** For some materials, using sensitive mode

### SPECIFICATIONS

| Cat # | Heating Temp | Heating Time | Heating Pressure (bar) | Cooling Time | Cooling Rate | Total Process Time | Removal Rate |
|---|---|---|---|---|---|---|---|
| **1210** | 180°C | 3.5 min | 250 | 1.5 min | High | 5 min | High |
| **1211** | 180°C | 2.5 min | 300 | 1 min | High | 3.5 min | High |
| **1212** | 180°C | 4 min | 350 | 6.5 min | Low | 10.5 min | High |
| **1213** | 180°C | 3.5 min | 325 | 2 min | High | 5.5 min | Low |
| **1214** | 180°C | 3 min | 250 | 2 min | Medium | 5 min | Medium |
| **1215** | 180°C | 3.5 min | 250 | 2 min | High | 5.5 min | High |
| **1216** | 180°C | 3.5 min | 250 | 1.5 min | High | 5 min | High |
| **1217** | 180°C | 3 min | 250 | 2 min | Medium | 5 min | Medium |
| **1218** | 180°C | 3 min | 250 | 2 min | Medium | 5 min | Medium |

### ORDERING INFORMATION

| Cat # | Description | Pkg Size |
|---|---|---|
| **1210** | Black/gray acryl with iron filler, thermoplastic | 1 kg |
| **1211** | Gray acryl with aluminium filler, thermoplastic | 1 kg |
| **1212** | Clear acryl, thermoplastic | 1 kg |
| **1213** | Black epoxy with mineral filler, thermosetting | 1 kg |
| **1214** | Green bakelite with wood filler, thermosetting | 1 kg |
| **1215** | Light yellow melamine with mineral and glass filler, thermosetting | 1 kg |
| **1216** | Black bakelite with carbon filler, thermosetting | 1 kg |
| **1217** | Black bakelite with wood filler, thermosetting | 1 kg |
| **1218** | Red bakelite with wood filler, thermosetting | 1 kg |



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# SAMPLE PREPARATION & SUPPLIES

## Cold and Hot Mounting Media and Molds (continued)

### Cold Mounting

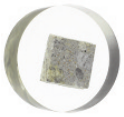
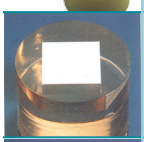
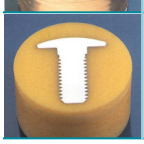
Cold mounting or embedding is when a resin is mixed with a hardener (or accelerator) to provide the mounting compound, and then the polymerization process take place to form the block. In some cases, this process gives-off heat. However this heat generation can be controlled by the use of ice or cool air blow setting. Cold mounting compounds are preferred for specimens that are sensitive to the heat or pressure, which applies during the hot mounting process. There are three types of cold mounting:

**1. Epoxy Systems —** Epoxies have the lowest shrinkage of all cold mounting resins. The curing time is relatively long, but the adhesion to most materials is excellent. They are also used for vacuum impregnation. The hardened epoxy is duroplastic and not affected by moderate heat or chemicals.

**2. Acrylic System —** Acrylics are easy to use resins with short curing times and negligible shrinkage. They consist of self-polymerizing components that harden with the addition of catalyst. Hardened acrylic is thermoplastic and resistant to most chemicals.

**3. Polyester Systems —** Polyester belongs to the catalyzed system, like acrylics. Curing times are relatively short and the hardened specimen is duroplastic.

### CHOOSING A COLD MOUNT*

| | Cat # | Resin | Color | Curing Time | Shrinkage 1-4 (Best=1) | Hardness | Application |
|---|---|---|---|---|---|---|---|
|  | **1232** | EpoFix | Clear, Transparent Refractive index: ND = 1.578 | Approx 12 hours | • | 78 Shore D | Vacuum impregnation, Porous samples, Mineralogical samples |
|  | **1233** | EMSFix | Clear, Transparent Refractive index: ND = 1.561 | 1½ hr in oven at 75°C/F 167° | • | 85 Shore D | Vacuum impregnation Porous samples Mineralogical samples |
|  | **1234** | UniMount | Clear, Transparent Refractive index: ND = 1.573 | 8 hours | • | 84 Shore D | Vacuum impregnation Porous samples Mineralogical samples |
|  | **1235** | TransFix | Colorless, clear (extremely clear when cured under pressure). Otherwise semi-transparent. | 20 min. | • • • | 83 Shore D | Vias Microvias |
| | **1245** | Epoxy-Dye | Fluorescent dye for use in microscopy to make cracks and pores visible. | – | – | – | For use with EpoFix and Unimount |
|  | **1256** | AcryMount | Dull yellowish, partly transparent | 10 min | • • • • | 82 Shore D | Routine examination |
|  | **1257** | GeoFix | Colorless, clear (extremely clear when cured . under pressure) | 20 min | • • • | 85 Shore D | Extraordinarily clear mounts |
|  | **1258** | MatFix | Light yellow | 30 min | • | 85 Shore D | Fast curing, No shrinkage |
|  | **1259** | LiteFix | Off-white | 20 min | • • | 84 Shore D | Edge Retention, Planeness |
|  | **1265** | Acrylic-Dye | Blue, Red & Yellow | – | – | – | Dyes for easy identification of acrylic mounts |
|  | **1270** | Poly-Mount | Transparent Polyester Low viscosity | 45 min | • • • • | – | Serial mounting of specimens not sensitive to heat |
|  | **1276** | Poly-AcryMount | White Polyester/ Acrylic | 18-25 min | • | – | Edge Retention, Planeness |

* 30 mm dia. mount with a 45% carbon steel specimen (20 vol%)

# SAMPLE PREPARATION & SUPPLIES

## Cold and Hot Mounting Media and Molds (continued)

### III Cold Mounting (continued)

### SPECIFICATIONS

| Cat # | Mixing Ratio Weight | Mixing Ratio Volume | Mixing Time | Potlife | Color | Can be colored with EpoDye | Can be colored with AcryDye | Peak Temp |
|---|---|---|---|---|---|---|---|---|
| **1232** | Resin: 25 parts<br>Hardener: 3 parts | Resin: 15 parts<br>Hardener: 2 parts | 2 min | 30 min | Clear, Transparent<br>Refractive index:<br>ND = 1.578 | X | | 40°C<br>104°F |
| **1233** | Resin: 25 parts<br>Hardener: 7 parts | Resin: 31 parts<br>Hardener: 10 parts | 5 min | >60 min | Clear, Transparent<br>Refractive index:<br>ND = 1.561 | X | | 170°C<br>338°F |
| **1234** | Resin: 7 parts<br>Curing Agent: 1 part | Resin: 26 parts<br>Curing Agent: 5 parts | 3 min | 60 min | Clear, Transparent<br>Refractive index:<br>ND = 1.573 | X | | 60°C<br>140°F |
| **1235** | Liquid: 11 parts<br>Powder: 9 parts | Liquid: 1 part<br>Powder: 2 parts | 30 sec | 2 min | Colorless, clear<br>(extremely clear when cured under pressure). Otherwise semi-transparent | X | X | 115°C<br>239°F |
| **1245** | — | — | — | — | Fluorescent dye<br>for use in microscopy to make cracks and pores visible | — | — | — |
| **1256** | Liquid: 10 parts<br>Powder: 15 parts | Liquid: 1 part<br>Powder: 2 parts | 30 sec | 3 min | Dull yellowish, partly transparent | X | — | 100°C<br>212°F |
| **1257** | Liquid: 6 parts<br>Powder: 10 parts | Liquid: 2 parts<br>Powder: 5 parts | 1½ min | 1½ min | Colorless, clear<br>(extremely clear when cured under pressure) | X | X | 90°C<br>194°F |
| **1258** | Liquid I: 8 parts<br>Liquid II: 4 parts<br>Powder: 14 parts | Liquid I: 10 parts<br>Liquid II: 5 parts<br>Powder: 15 parts | 1½ min | 4 min | Light yellow | — | X | 138°C<br>280°F |
| **1259** | Liquid: 10 parts<br>Powder: 20 parts | Liquid: 1 part<br>Powder: 2 parts | 45 sec | 1½ min | Off-white | — | X | 75°C<br>167°F |
| **1265** | — | — | — | — | Blue, Red & Yellow | — | — | — |
| **1270** | — | — | — | —— | Transparent Polyester<br>Low viscosity | — | — | —— |
| **1276** | — | — | — | — | White Polyester/<br>Acrylic | — | — | 114°C |

EpoFix Kit

### ORDERING INFORMATION

| Cat # | Description | Qty. |
|---|---|---|
| **(a) Epoxy Systems** | | |
| **1232** | EpoFix Kit with 1L liquid resin, 130 ml hardening liquid | Kit |
| **1233** | EMSFix Kit with 1L resin, 325 ml hardening liquid | Kit |
| **1234** | UniMount Kit with 500 ml liquid resin, 200 ml hardening liquid | Kit |
| **1235** | TransFix Kit with 570g powder, 500 ml liquid | Kit |
| **1245** | Epoxy-Dye, 20g | Kit |
| **(b) Acrylic Systems** | | |
| **1256** | AcrylMount Kit with 500g resin powder, 225 ml hardening liquid | Kit |
| **1257** | GeoFix Kit with 800g powder, 500 ml liquid | Kit |
| **1258** | MatFix Kit with 570g powder, 300 ml liquid I, 150 ml liquid II | Kit |
| **1259** | LiteFix Kit with 600g powder, 300 ml liquid | Kit |
| **1265** | Acrylic-Dye, 60 ml (20 ml each yellow, red, blue) | Set of 3 |
| **(c) Polyester Systems** | | |
| **1270** | PolyMount Kit with 500 ml liquid resin; 15 ml hardening liquid | Kit |
| **(d) Polyester/Acrylic Systems** | | |
| **1276** | PolyAcryMount Kit with 870 g resin powder; 300 ml hardening liquid | Kit |



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# SAMPLE PREPARATION & SUPPLIES

## Cold and Hot Mounting Media and Molds (continued)

### Cold Embedding Molds

These 2-part molds may be used for all cold embedding epoxies. Comes with a detached cap for easy removal. Available in 3 sizes. Made from HDPE. We recommend the use of mold release spray *(Catalog #72619)* prior to use.

| Cat No. | Description | Qty. |
|---|---|---|
| **50481-20** | Cold Embedding Molds 1" | 10/pk |
| **50481-21** | Cold Embedding Molds 1½" | 10/pk |
| **50481-22** | Cold Embedding Molds 1¼" | 10/pk |

### Disposable Mold Cup

Polyethylene, one part molds. Closed one end. Red

| Cat No. | Description | Qty. |
|---|---|---|
| **50480-10** | Disposable Mold Cup 1⅛" | 50/pk |
| **50480-15** | Disposable Mold Cup 1¼" | 50/pk |
| **50480-20** | Disposable Mold Cup 1½" | 50/pk |

### Form Mold



The form mold is a two part mounting cup, designed to be as user-friendly as possible, with practical handles for removing the lid and the slightly conical shape for removing the mounts.

| Cat No. | Description | Qty. |
|---|---|---|
| **51012-01** | Form 25 mm / 1" dia | 5/pk |
| **51012-02** | Form 30 mm dia | 5/pk |
| **51012-03** | Form 40 mm dia | 5/pk |
| **51012-04** | Form 50 mm / 2" dia | 5/pk |
| **51012-05** | Form 1¼" dia | 5/pk |
| **51012-06** | Form 1½" dia | 5/pk |

### Silicone Mold

This mold is for acrylic resins only and the best mounting cup for all of our acrylic resins. The flexible silicone rubber makes it very easy to remove the mount from the mounting cup.

| Cat No. | Description | Qty. |
|---|---|---|
| **51012-25** | Silicone 25 mm | 5/pk |
| **51012-30** | Silicone 30 mm | 5/pk |
| **51012-32** | Silicone 32 mm | 5/pk |
| **51012-38** | Silicone 38 mm | 5/pk |
| **51012-40** | Silicone 40 mm | 5/pk |

### Parallel Mold

Mounting cup's parallel sides help avoid tilting of the mount when clamped into a specimen holder.

| Cat No. | Description | Qty. |
|---|---|---|
| **51012-70** | Parallel 25 mm dia | 5/pk |
| **51012-75** | Parallel 30 mm dia | 5/pk |
| **51012-80** | Parallel 40 mm dia | 2/pk |

### Flexible Mold



The rectangular flexible molds made of very flexible transparent silicone rubber which makes it very easy to remove the mounts. The inner sides are polished, so the sides of the mounts get clear. The sides are also straight which makes it easier to fasten the mounts in a specimen holder.

| Cat No. | Description | Qty. |
|---|---|---|
| **51012-55** | Flexible 68 x 37 x 35 mm | 2/pk |
| **51012-60** | Flexible 90 x 50 x 35 mm | 2/pk |
| **51012-65** | Flexible 120 x 60 x 45 mm | each |

### Phenolic Ring Mold

Impregnated phenolic, ¾" high

| Cat No. | Description | Qty. |
|---|---|---|
| **50483-15** | Phenolic Ring Mold ¼" | 10/pk |
| **50483-20** | Phenolic Ring Mold 1½" | 10/pk |

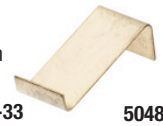
### Hot & Cold Mounting/ Embedding Accessories

Thermo Conductive Paste **50494-25**

PlastiClips **50487-25**

Fixation Clip **50487-30, 50487-31**

Taper Section Angles **50487-33**



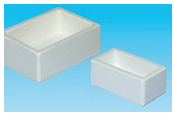
**50487-32**

| Cat No. | Description | Qty. |
|---|---|---|
| **50486-00** | 6 mm height metal spring clip to hold or position a small specimen upright. | 100/pk |
| **50487-25** | PlastiClips - Plastic clip used to support up to 5 small, thin specimens. (May not be suitable with Acrylic Resins) | 25/pk |
| **50487-30** | Fixation Clips, 6 mm dia; Support spring for small and thin specimens during mounting | 50/pk |
| **50487-31** | Fixation Clips, 9 mm dia; Support spring for small and thin specimens during mounting | 50/pk |
| **50487-32** | Taper Section Angle, Aluminium; *Makes measuring thickness of thin layers easier. By inclining the specimen you will get a magnification of the layer and this will enable you to make your measurement more reliable.* | 25/pk |
| **50487-33** | Taper Section Angle, Copper | 25/pk |
| **50487-34** | Taper Section Angle, Steel | 25/pk |
| **50487-35** | Silicone Oil/Release Agent | 100 ml |
| **50488-10** | Mold Release - Mold release agent to be used with mounting press. | 8g |
| **72619** | Mold Release - Mold release agent to be used with cold mounting mold, PTFE-like spray. | 15 oz can |
| **50494-25** | Thermo Conductive Paste - *For better heat transfer between heating/cooling unit and cylinder in hot mounting press.* | 25g |

### Silicone Rubber Molds, Reusable

These reusable molds for cold embedding are made from sturdy, flexible, white silicone, and are easily removed without release agents. Much smoother than rubber molds, they enable easy identification of samples in clear resins. They hold their shape to produce consistent, reliable round embedding.

**Rectangular Silicone Rubber Molds, Reusable**



1" high, ¾" internal depth.

| Cat No. | Description | Qty. |
|---|---|---|
| **50484-17** | 2¼ x 1" | 5/pk |
| **50484-18** | 3 x 2" | each |

**Round Silicone Rubber Molds, Reusable**

1" high, ¾" internal depth.

| Cat No. | Description | Qty. |
|---|---|---|
| **50484-10** | 1" (25.4 mm) dia. | 10/pk |
| **50484-12** | 1¼" (31.75 mm) dia. | 10/pk |
| **50484-14** | 1½" (38.1 mm) dia. | 10/pk |
| **50484-16** | 2" (50.8 mm) dia. | 5/pk |

### Pressure Chamber

*Designed for use with our cold molded acrylic and epoxy media.*

By placing encapsulated samples inside the chamber and applying between 30 to 40 PSI during the cure time, the mounting compound is compressed down and around the sample, forcing air up to the surface, helping to eliminate shrinkage, and increase clarity and edge retention. An optional air pump tank is available which is designed for hand pumping pressure.

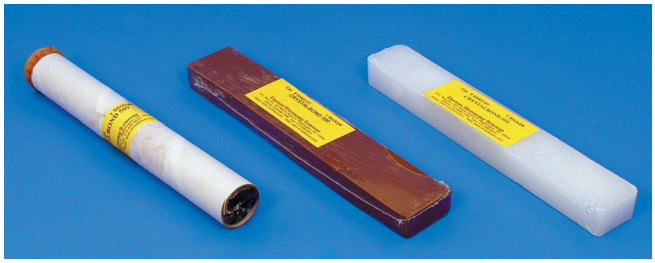
| Cat No. | Description | Qty. |
|---|---|---|
| **50465-10** | Pressure Chamber | each |
| **50465-20** | Air Pump | each |

# SAMPLE PREPARATION & SUPPLIES

## Adhesives & Mountants

### Crystalbond™/Wafer-Mount™

A temporary adhesive. These wash away adhesives are used as a temporary bond for holding delicate crystals, metallurgical specimens, glass components, and ceramic substrates for dicing, slicing, drilling and polishing. These materials adhere readily to metals, glass, ceramic and then can be washed after machining away using various solvents.



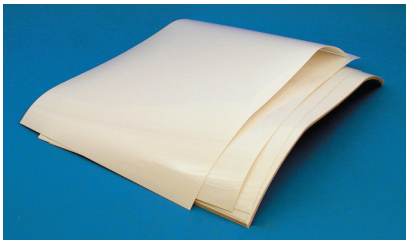
### APPLICATIONS

- Machining or slicing single crystal metal specimens.
- Grinding and polishing sapphire, ceramic, optical garnets, ferrites, and LCD glass.
- Dicing and slicing germanium and silicon wafers in semiconductor production.
- Holding beam leads in IC devices for pull-off tests.
- Dicing and slicing alumina and beryllia substrates for IC and micro-electronic production.
- Dicing subminiature chip capacitors and microwave IC substrates.

### CRYSTALBOND™ PROPERTIES AND ORDERING:

| Type | 509 | 555 | 590 |
|---|---|---|---|
| **Description** | Thermo polymer* | Thermo polymer | Thermo polymer* |
| **Form** | ⅞" Dia. x 7" stick | ½" x 1" x 7" stick | ⅝" x 1¼" x 7½" stick |
| **Softening** | 160°F (71°C) | 125°F (52°C) | 257°F (125°C) |
| **Flow Point** | 250°F (121°C) | 130°F (54°C) | 302°F (150°C) |
| **Viscosity at Flow Point** | 6,000 cps | 500 cps | 9,000 cps |
| **Color** | Clear/Amber | White | Brown |
| **Solvent** | Acetone or 509-S Stripper | Water | Methanol or 590-S Stripper |

*Thermoplastic polymer



**Crystalbond™ 509:** offers excellent adhesion to metals, glass, and ceramic. This material is the best for precise high purity work since it leaves no residue after dissolving and does not clog the diamond wheel as compared to conventional waxes. Each stick weighs about 90 grams.

| | | |
|---|---|---|
| **50400-01** | Crystalbond 509, Clear Stick | each |
| **50400-05** | Crystalbond 509 Clear Stick | 5/pk |
| **50400-50** | Crystalbond 509 Amber Stick | each |
| **50400-S1** | Crystal Bond 509 Stripper | 1 qt |
| **50400-S2** | Crystal Bond 509 Stripper | 1 gal |

**Crystalbond™ 555:** the same as 509 but used in applications where it is desirable to have a temporary bond which is water soluble. Each stick weighs about 90 grams.

| | | |
|---|---|---|
| **50401-01** | Crystalbond 555 | each |
| **50401-10** | Crystalbond 555 | 10/pk |

**Crystalbond™ 590:** the same as 509 but offers maximum adhesion to subminiature parts. Each stick weighs about 225 grams.

| | | |
|---|---|---|
| **50402-01** | Crystalbond 590 | each |
| **50402-02** | Crystalbond 590 | 2/pk |
| **50402-S** | Stripper | 100 g |

**Wafer-Mount™ 559:** is available in sheet form 10"x10" (254x254mm). To use, remove the paper backing exposing the adhesive layer. The substrate is positioned on the film and pressed down firmly so that it adheres to the plastic film. No heating is required. The wafer mounted on the plastic film can then be held down using a vacuum manifold or mechanical means for dicing or scribing. After dicing or scribing, the parts can be separated from the wafer-mount 559 film by washing in acetone or MEK. Ideal for holding down silicon wafers, alumina, or glass substrates for scribing.

| | | |
|---|---|---|
| **50403-02** | Wafer-Mount 559 | 2/pk |
| **50403-10** | Wafer-Mount 559 | 10/pk |

**Wafer-Mount™ 562:** a dry temporary adhesive film, 0.003" thick, which can be easily cut to size with either a razor or scissor. This mount permits pre-placement of the adhesive film exactly where the user wants it. It melts at 195-210°F. After application it can be dissolved rapidly in trichloroethylene or toluene. This material is particularly useful in applications where a pre-formed adhesive film is needed to assure uniform bonding and flatness or in bonding stacks of substrates such as LCD glass slides for slicing. Sheet size 8"x10".

| | | |
|---|---|---|
| **50404-10** | Wafer-Mount 562 | 10/pk |
| **50404-20** | Wafer-Mount 562 | 20/pk |

### EMS Positioning Putty

Blue plastic, non-hardening putty easily positions difficult materials at the angle you want to examine them or holds items in place during specimen preparation. It's like having an extra hand in the lab! Easily moldable and reusable, the putty will not permanently stick to solid samples or mounts. The blue color offers excellent contrast to most materials under the microscope. Contains odorless acrylic.

| | | |
|---|---|---|
| **50466** | EMS Positioning Putty | 113g |



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# SAMPLE PREPARATION & SUPPLIES

## Adhesives & Mountants (continued)

### QuickStick™ 135 Temporary Mounting Wax

- **Acetone soluble - Ideal for high purity work**
- **Low Melting Point - Flows at 135˚ C**
- **Crystal Clear - Good for applications utilizing transmitted light.**

This temporary mounting wax is used in a variety of applications to bond samples during a processing application. After processing, the mounting wax is washed away in acetone leaving no residue.

#### TYPICAL APPLICATIONS INCLUDE:

- **Single Sample Preparation.**
- **Single Crystal Mounting**
- **Metallurgical Applications**
- **Wire Sawing**
- **Grinding and Polishing**
- **Ultrasonic Cutting**

#### SPECIFICATIONS

Thermoplastic polymer. Softening point is 71˚ C (160˚F). Flow point is 135˚ C (275˚ F). Viscosity at flow point is 6,000cps. The color is crystal clear and it dissolves in acetone. QuickStick™ comes 20 sticks/tray and it weighs approximately 350 grams. Each stick measures 3"(L) x ¼" (W) x ¼"(H) (76mm x 6mm x 6mm)

| | | |
|---|---|---|
| **50419-20** | Quick-Stick™ 135 | 20/pk |

### Mounting Wax 100

MWM100 Black Wax is designed for use as a masking material in jet polishing applications. As it is chemically inert, it is resistant to etching solutions such as hydrofluoric acid, perchloric acid and acetic acid. While it is resistant to many acids, it can be easily removed with hydrocarbon or chlorinated solvents. 100 Gram/Pkg (5 - 20 gram sticks). Moderate Hardness and a Melting Point of 100˚ C.

**Dilutent: Hydrocarbon or Chlorinated solvents**

| | | |
|---|---|---|
| **50390-100** | Mounting Wax 100 | 100 Grams |

### Mounting Wax 80

MWH080 is an amber colored wax, which is translucent in thin films. High hardness makes it ideal for sawing, ultrasonic cutting and lapping & polishing operations. Best suited to vitreous materials, polished metal surfaces, semiconductors and piezoelectric materials with large contacted areas. Chemical resistant. 100 Gram/Pkg of 4 sticks .5" x .5" x 7" long (12.5 x 12.5 x 175mm). Hard hardness with a Melting Point of 80˚C.

**Dilutent: Ethanol and Acetone**

| | | |
|---|---|---|
| **50390-80** | Mounting Wax 80 | 100 Grams |

### Mounting Wax 52

MWS052 is a tan colored wax, which is translucent on thin films. Softness makes it most useful with abrasive slurry cutting of materials. Best suited to non-porous surfaces such as glass or polished metal with a reasonably large area. Easily soluble in a variety of solvents. 113 Grams/1 Stick, 1" x 1" x 7.5" long (25 x 25 x 190 mm).Soft Hardness and a Melting Point of 52˚C.

**Dilutent: Perchloroethylene**

| | | |
|---|---|---|
| **50390-52** | Mounting Wax 52 | 1/pk |

### Mounting Wax 70

MWM070 is a quartz type sticky, orange colored wax (translucent in thin films) used to hold crystals or other materials while they are being sliced, lapped or polished. Moderate hardness and strength make it useful for bonding small samples in diamond wheel sawing and wire sawing operations. Widely used for holding semiconductors, optical materials, ceramics and metals with medium to large contact areas. Chemical resistant. 100 Gram /Pkg of 29 sticks, .25" dia x 4" long (6mm dia x 100mm). Moderate Hardness and a Melting Point of 70˚C.

**Dilutent: Warm soapy water**

| | | |
|---|---|---|
| **50390-70** | Mounting Wax 70 | 100 Grams |

### Wax Stripper

WaxStrip™ is an environmentally safe powder compound prepared primarily for the removal of mounting waxes in semiconductor processing. WaxStrip™ is compatible for use on silicon, glass, iron, aluminum, zinc, brass, copper, magnesium and other materials. 1lb/bottle.

| | | |
|---|---|---|
| **50392-01** | Wax Stripper | each |

### M-Bond System

The M-Bond system includes M-Bond 43-B, M-Bond 600 and M-Bond 610. These adhesives are high-performance epoxy resins, which are formulated especially for bonding strain gages and special-purpose sensors. When properly cured, these adhesives are useful in temperatures ranging from -452°F to +350° F (-269°C to+ 175°C) with M-Bond 43-B, and to +700°F (+370°C) for short periods with M-bond 600 and 610. In common with other organic materials, oxidation and sublimation effects at elevated temperatures limit life. M-Bond 43B is particularly recommended for transducer applications up to+250°F (+120°C) and M-Bond 610 for transducers up to +450°F (+230°C)

Shelf Life and Post Life: At room temperature, M-Bond 600 has a useful storage life of approximately three months, while M-Bond 43-B and M-Bond 610 will last about nine months.

Once opened and mixed, M-Bond 600 and 610 have room temperature pot lives of two weeks and six weeks, respectively. Since M-Bond 43B is supplied already mixed, its pot life is about the same as its shelf life when kept in a tightly closed container. These periods of adhesive usefulness can often be doubled by refrigeration at +30° to +40°F (0 to +5°C). Never open a refrigerated bottle until it has reached room temperature.

**Curing Time:**

M-Bond 43B is about 2 hours at +375°F (+190°C)
M-Bond 600 is about 3.5 hours at +350°F (170°C)
M-Bond 610 is about 3 hours at 375°F (190°C)

| | | | | |
|---|---|---|---|---|
| RT | **50410-10** | M-Bond 43B | 4 x 25 ml | Kit |
| RT | **50410-20** | M-Bond 600 | 4 x 10 ml A<br>4 x 15 ml B | Kit |
| RT | **50410-30** | M-Bond 610 | 4 x 15 ml A<br>4 x 10 ml B<br>Catalyst | Kit |

# SAMPLE PREPARATION & SUPPLIES

## Adhesives & Mountants (continued)

### Loctite Adhesives


#### Loctite 409™ Super Bonder®

For a general-purpose gel adhesive, clear, gap fills 0.010"; surface insensitive Ethyl, tensile shear strength 3,200 psi, and temperature range –65°F to 180°F. Cure speed: fixture - 75 seconds, full - 24 hours.

#### Loctite 454™ Prism®

For use with porous surfaces, clear, gap fills 0.010", surface insensitive Ethyl, gel type, tensile shear strength 3200 psi, temperature range –65°F to 180°F. Cure speed: fixture – 15 seconds, full - 24 hours.

#### Loctite 4861™ Prism®

For use with flexible surfaces, clear, gap fill 0.008", surface flexible Alkyl, viscosity 4,000 cP, tensile shear strength 2465 psi, temperature range –65°F to 212°F. Cure speed: fixture – 25 seconds, full – 24 hours.

#### Loctite 349™ Impruv®

For bond glass/metal, appearance: clear/straw, cure type: UV, viscosity: 9,500cP, shore hardness: D70, temperature range: –65°F to 266°F

#### Loctite 4011™ Prism®

Designed for the assembly of difficult-to-bond materials, such as wood, paper, leather and fabric. Suitable for use in the assembly of disposable medical devices. The product provides rapid bonding of a wide range of materials, including metals, plastic and elastomers. Cure speed: 2 to 20 seconds depending on the material.

**Chemical type:** Ethyl cyanoacrylate, transparent, colorless to straw colored fluid. One part required no mixing. Low-viscosity (100 cP). Cure by humidity, and temperature range –65°F to 180°F

| | | | |
|---|---|---|---|
| RT | **72570-09** | Loctite Super Bonder 409 | 3 g Tube |
| RT | **72571-54** | Loctite Prism 454 Adhesive | 3 g Tube |
| RT | **72572-61** | Loctite Prism 4861 Adhesive | 20 g |
| RT | **72582-01** | Loctite 349 Impruv Adhesive | 50 ml |
| RT | **72573-11** | Loctite Prism 4011 Adhesive | 20 g |

#### Loctite 404 Quick Set Tissue Adhesive


This adhesive is perfect for those applications where a quick-curing adhesive is needed. Comes in an applicator-tipped bottle, 0.33 oz. (10ml).

| | | | |
|---|---|---|---|
| RT | **12687-01** | Loctite 404 Quick Set Tissue Adhesive | 10ml |

#### Loctite™ 460 Adhesive


Our Loctite™ 460 is a quick curing low viscosity glue that can be used for mounting samples to any substrate (glass, metal and/or plastic). It is soluble in acetone. Comes in an applicator-tipped plastic bottle — 20 g.

| | | | |
|---|---|---|---|
| RT | **12646-08** | Loctite™ 460 Adhesive | each |

#### Loctite® Fixmaster® Poxy Pak™, Fast Cure Epoxy


This fast cure, general purpose epoxy bonds virtually any material. It will also fill or seal cracks and rebuild worn surfaces. Comes in a 1 oz. syringe with a built-in plunger for easy dispensing without equipment. Working time is approximately 4 minutes. Includes nozzle and mixing stick. This unique adhesive may be made electrically conductive with the addition of any conductive powder (Silver, Carbon etc.)

| | | | |
|---|---|---|---|
| RT | **12646-09** | Loctite® Fixmaster® Poxy Pak™, Fast Cure Epoxy | each |

### Mikrostik™ Adhesive, Non-Conductive


Fast drying, ultrathin clear adhesive suitable for mounting small particles which can be submerged in other adhesives. It can be diluted with methyl ethyl ketone. Quick-drying. Comes in a bottle with an applicator brush. 14 ml.

| | | | |
|---|---|---|---|
| RT | **12646-01** | Mikrostik™ Adhesive, Non-Conductive | 14ml |

### EMS Quick Dry Adhesive and Remover Kit

**Adhesive:** A clear, fast curing cyanoacrylate adhesive developed as an alternative for bonding samples and non-porous materials to similar materials or glass. Bonded samples are easy to remove using the remover.

**Remover:** A clear liquid for destabilizing and debonding cured cyanoacrylates. Will work on Loctite, Henkel, Permabond, 3M, and more brands of cyanoacrylate glue. Helpful for cleaning cyanoacylates from surfaces and containers.

Test first before using on plastic. Avoid repeated contact with skin.

**Kit includes:** Adhesive and Remover, each in 20 ml applicator-tipped bottles.

| | | | |
|---|---|---|---|
| | **12647** | EMS Quick Dry Adhesive and Remover Kit, 2x20ml | Kit |

### Krazy Glue™ Pen

The one we all know and have used. Ready to use. Requires no mixing or preparation. This pen contains cyanoacrylate. Clear in color and bonds immediately. Comes in a 3g tube.


| | | | |
|---|---|---|---|
| RT | **12646-05** | Krazy Glue™ Pen | each |



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# Cargille Meltmounts

Cargille Meltmount™ (optical quality) is a series of mounting media which are specifically formulated for use in microscope slide mounting and in other optical coupling applications.


## FEATURES

- Instant thermal mountants that require "no-oven-time".
- 100% Usable; contains no solvents.
- Reversible, thermally, for particle retrieval or re-orientation
- Soluble in toluene for special techniques or clean-up.
- PCB-Free.
- Fluid at 65°C, a temperature chosen because it makes permanent mount and protects the majority of specimens from thermal changes.
- Direct replacement for old mountant mediums (Canada Balsam, Aroclor 5442, Naphrax...)

Melt Mount is also available in a Quick-Stick™ form which can be used to make permanent microscope slide mounts quickly. These Melt Mount sticks can be applied to a slide on a hotplate. As soon as the specimen and coverglass are positioned and the slide is cooled you have a permanent prepared slide that can be reversed by reheating, if you should wish to retrieve a particular particle. Each Quick-Stick™ weighs approximately ⅔ oz. (18g).

### 1. Meltmount™ 1.539

Has a refractive index ($n_D$ @25°C) of 1.539 and an Abbe V dispersion of 45. Its optically similar to Canada Balsam and therefore ideal for mounting many biological specimens but without the long drying time of Canada Balsam.

| | | | |
|---|---|---|---|
| RT | **17994-10** | Meltmount 1.539 | 1 oz. |
| RT | **17994-11** | Meltmount 1.539 Quick-Stick™ | each |

### 2. Meltmount™ for Chrysotile Asbestos

It has dispersion characteristics making it appropriate for mounting chrysotile asbestos.

| | | | |
|---|---|---|---|
| RT | **17994-20** | Meltmount for Chrysotile | 1 oz. |

### 3. Meltmount™ 1.582

It has a refractive index nD @25°C) of 1.582 and an Abbe V dispersion of 33. Its optical clarity makes it the preferred choice for minimum visible absorption.

| | | | |
|---|---|---|---|
| RT | **17994-30** | Meltmount 1.582 | 1 oz. |
| RT | **17994-31** | Meltmount 1.582 Quick-Stick™ | each |

### 4. Meltmount™ 1.605

It has a refractive index (nD @25°C) of 1.605 and an Abbe V dispersion of 30, making it appropriate for mounting Asbestiform Tremolite, Anthophyllite, and Actinolite.

| | | | |
|---|---|---|---|
| RT | **17994-40** | Meltmount 1.605 | 1 oz. |
| RT | **17994-41** | Meltmount 1.605 Quick-Stick™ | each |

### 5. Meltmount™ 1.662

It has a refractive index (nD @25°C) of 1.662 and an Abbe V dispersion of 26, optically similar to Aroclor 5442 but is PCB-free.

| | | | |
|---|---|---|---|
| RT | **17994-50** | Meltmount 1.662 | 1 oz. |
| RT | **17994-51** | Meltmount 1.662 Quick-Stick™ | each |

### 6. Meltmount™ 1.680

It has a refractive index (nD @25°C) of 1.680 and an Abbe V dispersion of 25, making it appropriate for mounting Amosite and Crocidolite asbestos.

| | | | |
|---|---|---|---|
| RT | **17994-60** | Meltmount 1.680 | 1 oz. |
| RT | **17994-61** | Meltmount 1.680 Quick-Stick™ | each |

### 7. Meltmount™ 1.704

It has a refractive index (nD @25°C) of 1.704 and an Abbe V dispersion of 24, similar to Naphrax.

| | | | |
|---|---|---|---|
| RT | **17994-70** | Meltmount 1.704 | 1 oz. |
| RT | **17994-71** | Meltmount 1.704 Quick-Stick™ | each |

# Replication Materials

## Cellulose Acetate Films

This acetate film softens in acetone and can be used for duplicating purposes. Acetate film which is wet with acetone can then be applied to a surface which has been wet with acetone. It is easily removed away from the object when dry. Acetate films come in 35µm thicknesses.

| | | |
|---|---|---|
| **50420-30** | Acetate Film 35µm, 10x15cm Sheet | 20/pk |

## Collodion (Parlodion), 2% in Amyl Acetate

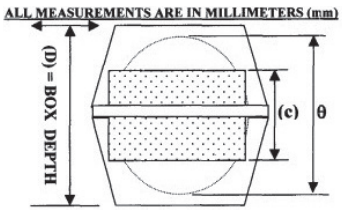
Highly purified nitrocellulose (parlodion strip) in glass distilled amyl acetate. Useful for forming a negative replica to very fine detail. Two types are available: Our sterile formula which is filtered down to 0.45 micron and our non-sterile formula.

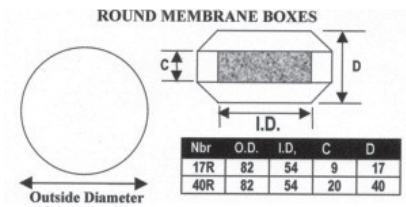
| | | | |
|---|---|---|---|
| RT | **12620-00** | Non-Filter 2% Collodion in Amyl Acetate | 100 ml |
| RT | **12620-10** | Sterile 2% Collodion in Amyl Acetate (Ultra-Pure) | 100 ml |
| RT | **12620-30** | Non-filter 2% Collodion in Amyl Acetate | 30 ml |
| RT | **12620-34** | Non-filter 2% Collodion in Amyl Acetate | 4x30 ml |
| RT | **12620-50** | Sterile 2% Collodion in Amyl Acetate (Ultra-Pure) | 30 ml |
| RT | **12620-55** | Sterile 2% Collodion in Amyl Acetate (Ultra-Pure) | 4x30 ml |

# SAMPLE PREPARATION & SUPPLIES

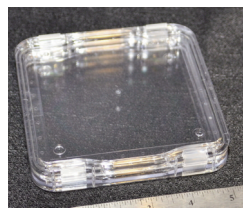
## Membrane Boxes

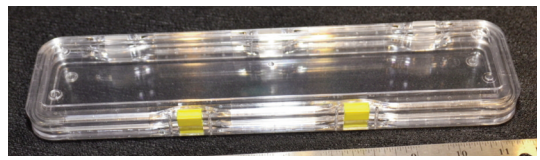
Our unique membrane storage boxes for the transfer, storage and shipping of many delicate items. Available in 5 different shapes and sizes these plastic containers, with a double elastic membrane on the top and bottom, offer security for all of your sensitive items. Once your item is placed in the box the elastic membrane conforms around the enclosed object and protects it from any movement.

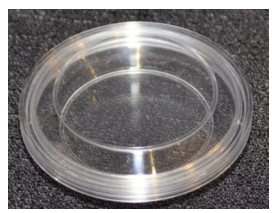


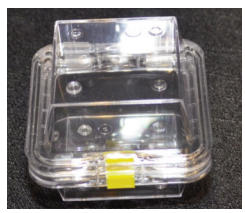




| Nbr | O.D. | I.D. | C | D |
|---|---|---|---|---|
| 17R | 82 | 54 | 9 | 17 |
| 40R | 82 | 54 | 20 | 40 |







### Round Membrane Boxes

| Cat. # | O.D, mm | I.D, mm | C | D | Qty |
|---|---|---|---|---|---|
| 64304-20 | 82 | 54 | 20 | 40 | each |
| 64304-30 | 82 | 54 | 9 | 17 | each |

| Cat. # | Overall Dimensions L, mm | Overall Dimensions W, mm | Overall Dimensions D, mm | Maximum Useful Area Dimensions L, mm | Maximum Useful Area Dimensions W, mm | Maximum Useful Area Dimensions D, mm | Capacity Weight | Qty |
|---|---|---|---|---|---|---|---|---|
| **Rectangular Boxes** | | | | | | | | |
| 64304-27 | 250 | 200 | 212 | 162 | 18 | — | — | each |
| 64304-28 | 250 | 200 | 204 | 154 | 40 | — | — | each |
| 64304-29 | 100 | 50 | 67 | 20 | 20 | — | — | each |
| 64304-36 | 100 | 50 | 16 | 67 | 17 | 9 | 8g | each |
| 64304-38 | 100 | 75 | 16 | 67 | 42 | 9 | 19g | each |
| 64304-39 | 100 | 75 | 25 | 62 | 37 | 18 | 31g | each |
| 64304-40 | 125 | 75 | 25 | 87 | 37 | 18 | 44g | each |
| 64304-41 | 150 | 75 | 25 | 112 | 37 | 18 | 56g | each |
| 64304-42 | 150 | 125 | 25 | 112 | 87 | 18 | 132g | each |
| 64304-43 | 150 | 125 | 50 | 112 | 79 | 20 | 246g | each |
| 64304-44 | 250 | 200 | 100 | 188 | 138 | 60 | 1557g | each |
| 64304-45 | 250 | 200 | 200 | 157 | | | 3371g | each |
| 64304-46 | 300 | 150 | 16 | 267 | 117 | 9 | 211g | each |
| 64304-51 *This box has no stackable feet.* | 100 | 50 | 50 | 54 | 17 | 12 | — | each |
| 64304-52 | 150 | 100 | 25 | 92 | 92 | 9 | — | each |
| 64304-54 | 150 | 100 | 75 | 104 | 54 | 59 | — | each |
| 64304-55 | 300 | 150 | 25 | 267 | 117 | 19 | — | each |
| 64304-56 | 300 | 150 | 75 | 246 | 96 | 60 | — | each |
| 64304-57 | 175 | 100 | 25 | 137 | 62 | 18 | — | each |
| 64304-58 | 175 | 100 | 50 | 129 | 54 | 40 | — | each |
| 64304-59 | 200 | 150 | 50 | 154 | 104 | 40 | — | each |
| **Square Boxes** | | | | | | | | |
| 64304-10 | 38 | 38 | 18 | 31 | 31 | 9 | 10g | 12/pk |
| 64304-11 | 100 | 100 | 16 | 67 | 67 | 9 | 30g | each |
| 64304-12 | 100 | 100 | 25 | 62 | 62 | 18 | 52g | each |
| 64304-13 | 100 | 100 | 50 | 54 | 54 | 40 | 88g | each |
| 64304-14 | 125 | 125 | 16 | 92 | 92 | 9 | 57g | each |
| 64304-15 | 125 | 125 | 25 | 87 | 87 | 18 | 102g | each |
| 64304-16 | 125 | 125 | 50 | 79 | 79 | 40 | 187g | each |
| 64304-17 | 150 | 150 | 100 | 88 | 88 | 80 | 465g | each |
| 64304-18 | 125 | 125 | 75 | 92 | 92 | 60 | — | each |
| 64304-19 | 150 | 150 | 25 | 112 | 112 | 18 | — | each |
| 64304-21 | 150 | 150 | 75 | 104 | 104 | 60 | — | each |
| 64304-22 | 100 | 100 | 75 | — | — | — | — | each |
| 64304-23 | 175 | 175 | 25 | 137 | 137 | 18 | — | each |
| 64304-24 | 175 | 175 | 50 | 129 | 129 | 40 | — | each |
| 64304-25 | 200 | 200 | 25 | 162 | 162 | 18 | — | each |
| 64304-26 | 200 | 200 | 50 | 154 | 154 | 40 | — | each |
| 64304-50 | 150 | 150 | 50 | 104 | 104 | 40 | 324g | each |



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# SAMPLE PREPARATION & SUPPLIES

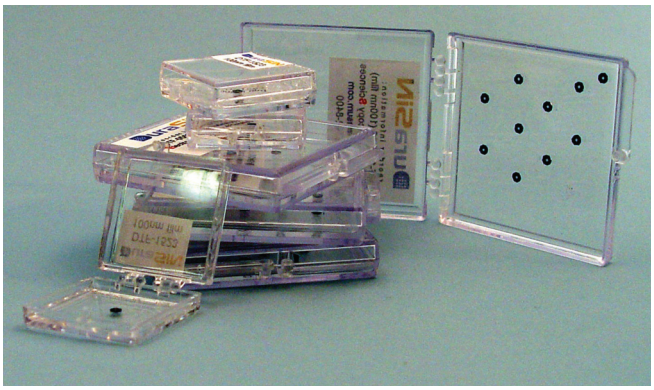
## Gel-Pak® Storage/Carrier Box

*Patented gel technology – the innovative solutions for storage and carrying delicate materials*

The traditional Gel-Box, Gel-Tray® and Gel-Slide Carriers are perfect for applications where devices are manually offloaded by tweezers or by hand.

- **Gel-Box (AD Series) - Hinged plastic boxes coated with Gel in the bottom.**
- **Gel-Tray® (BD Series) - A removable 2" plastic tray coated with Gel and contained inside a hinged plastic box.**
- **Gel-Slide (CD series) - A removable 2"glass slide coated with Gel and contained inside a hinged plastic box.**

(Gel-Pak® is A Division of Delphon Industries)



## GEL-BOX (AD Carrier Boxes)

Gel-Box AD Series Carriers owe their unique device-holding capabilities to a proprietary GEL coating applied directly to the bottom of a hinged box. Devices are held once contact is made with the GEL surface and will stay in place, even if the carrier is tilted or jarred. The carriers are designed for manual off-loading with tweezers or by hand. GEL-PAK AD series are ideal for handling devices where no direct contact with the top of the device is important.

The GEL-BOX Carriers may also be used for bare die handling, such as GaAs, PETs, laser diodes, and beam-lead devices where the die size is small (less than 1mm) and tweezers or other specialized techniques are used for off-handling.

### FEATURES

- **No need for custom-molded containers for each device size.**
- **Ideal for handling subassemblies, hybrid models and packaged devices.**
- **Available in Transparent, Conductive and Anti-Static carriers in multiple sizes.**
- **Retention Level available: x0, x1, x2, x3, x4, x5, and x8 (the higher the number the more retention capability)**

***We offer standard retention level X4. Other retention levels are available with the order of 100 or more, and at least two weeks for delivery.***

| Cat No. | Overall Box Size | Description | Qty. |
|---|---|---|---|
| **64900-x4** | 1" x 1" x ¼" | Transparent Hinged Box | 50/pk |
| **64901-x3** | 2" x 2" x ¼" | Antistatic Gel-Box | 50/pk |
| **64901-x4** | 2" x 2" x ¼" | Conductive Hinged Box | 50/pk |
| **64902-x4** | 2" x 2" x ¼" | Anti-Static Top & Conductive Hinged Box | 50/pk |
| **64903-x4** | 2" x 2"x ¼" | Anti-Static Hinged Box | 50/pk |
| **64904-x4** | 2" x 3"x ⅜" | Conductive Hinged Box | 50/pk |
| **64905-x4** | 2" x 3"x ⅜" | Anti-Static & Conductive Hinged Box | 50/pk |
| **64906-x4** | 3.5" x 4.5" x 0.5" | Conductive Hinged Box | 50/pk |
| **64908-X3** | 4.5" x 3.5" x 0.875" | Conductive Base/Antistatic Lid Gel-Box | 50/pk |
| **64907-x4** | 3.5" x 4.5" x 7/8" | Transparent Hinged Box | 50/pk |
| **64908-x4** | 3.5" x 4.5" x 7/8" | Conductive Hinged Box | 50/pk |
| **64909-x4** | 2.5" x 3.5" x 0.5" | Anti Static Top & Conductive Hinged Box | 50/pk |
| **64910-x3** | 6" x 4" x 0.5" | Conductive Gel-Box | 50/pk |
| **64911-x3** | 6" x 4" x 0.5" | Transparent Gel-Box | 50/pk |
| **64912-x3** | 7" x 5" x 1" | Conductive Base/Antistatic Lid Gel-Box | 50/pk |
| **64913-x3** | 7" x 5" x 1" | Conductive Gel-Box | 50/pk |
| **64914-x3** | 7.75" x 3.5" x 1" | Conductive Gel-Box | 50/pk |
| **64915-x3** | 9.937" x 3.5" x 0.625" | Transparent Gel-Box | 50/pk |

## GEL-TRAY® (BD Series) And GEL-SLIDE (CD Series)

Same as the Gel-Box, the Gel-Tray and Gel-Slide products are intended for manual applications in which the devices are loaded and unloaded using tweezers or by fingers. The Gel-Pak BD and CD series of pocketless trays are both configured as a 2" carrier stored in a protective plastic hinged box. The Gel coating is applied directly to the surface of the plastic tray (BD Series) or glass slide (CD Series).

These products offer the same functionality as the Gel-Box, however the plastic tray or glass slide can be easily removed from the box allowing for convenient handling when loading or unloading fixtures are being used.

The Gel-Slide (coated glass slides) is designed for higher temperature applications such as bonding and reflow where a plastic tray will not work. The CD slide has a temperature capability up to 220˚C. The CD glass slides are also ideal for backside inspection due to their optical clarity.

Both the Gel-Tray and Gel-Slide products are available in the standard retention levels (X0, X4, X5, and X8) to accommodate variations in device size, weight, and surface roughness.

The protective 2" hinged boxes are available in transparent styrene (T), conductive black (C) and antistatic (AS) materials. The boxes, trays, and slides may be customized with a print pattern (grid) or company logo.

| Cat No. | Overall Box Size | Description | Qty. |
|---|---|---|---|
| **64900-10** | 2" x 2" | Conductive BD Tray in Antistatic Hinged Box | 50/pk |
| **64900-11** | 2" x 2" | Conductive BD Tray in Conductive Base/ Antistatic Lid Hinged Box | 50/pk |
| **64900-12** | 2" x 2" | Conductive BD Tray in Conductive Base/ Transparent Lid Hinged Box | 50/pk |
| **64900-13** | 2" x 2" | Conductive BD Tray in Conductive Hinged Box | 50/pk |
| **64900-14** | 2" x 2" | Conductive BD Tray in Transparent Hinged Box | 50/pk |
| **64900-15** | 2" x 2" | Conductive BD Tray in "High Clearance" Antistatic Hinged Box | 50/pk |
| **64900-16** | 2" x 2" | Transparent BD Tray in Antistatic Hinged Box | 50/pk |
| **64900-17** | 2" x 2" | Transparent BD Tray in Conductive Base/ Antistatic Lid Hinged Box | 50/pk |
| **64900-18** | 2" x 2" | Transparent BD Tray in Conductive Hinged Box | 50/pk |
| **64900-19** | 2" x 2" | Transparent BD Tray in Transparent Hinged Box | 50/pk |
| **64900-20** | 2" x 2" | Glass Slide in Transparent Hinged Box | 50/pk |
| **64900-21** | 2" x 2" | Glass Slide in Conductive Hinged Box | 50/pk |
| **64900-22** | 2" x 2" | Glass Slide in Antistatic Hinged Box | 50/pk |
| **64900-23** | 2" x 2" | Glass Slide in MAG-40 Cassette | 50/pk |

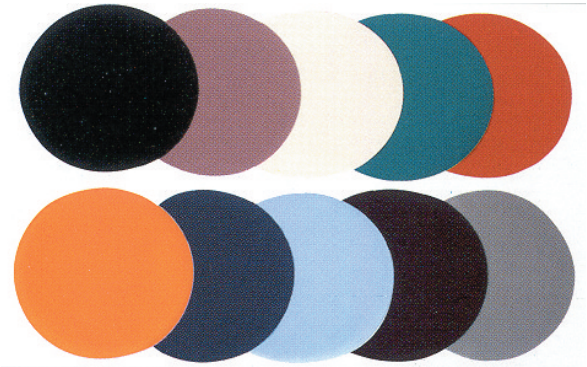
# SAMPLE PREPARATION & SUPPLIES

## Polishing and Lapping Supplies

### Polishing Cloths

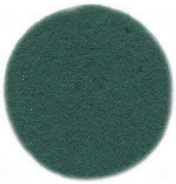
We offer a wide range of polishing cloths which are ideally suited for the preparation of metallographic specimens and other materials needing an extremely fine finish. They are available in a Pressure Sensitive Adhesive (PSA) as well as Plain Backing (PB); with 2½" diameter hole on the center or No Hole (N/H).

* Available with PSA backing only
** Available with Plain backing only
*** Available with PSA and or Plain backing



### Billiard***

100% virgin wool sheared pile. Recommended for intermediate and final polishing steps.



| Cat. # | Description | Pack |
|---|---|---|
| **50300-10** | Billiard, 10" x N/H, PB | 5/pk |
| **50300-08** | Billiard, 8" x N/H, PSA | 5/pk |

### KemPad*

A non-woven textile cloth which is both oil and water resistant. Recommended for intermediate and final polishing with diamond abrasive compounds. Excellent flatness.

| Cat. # | Description | Pack |
|---|---|---|
| **50310-05** | Kempad, 8" x N/H, PSA | 5/pk |
| **50310-15** | Kempad, 8"x 2½", PSA | 5/pk |

### Glendur*

A fine stainless steel mesh on an aluminum foil polyethylene backing. Extremely durable material and, excellent removable rate when used with a diamond compound in the 45 to 60 micron range. Recommended for coarse and intermediate polishing.

| Cat. # | Description | Pack |
|---|---|---|
| **50332-05** | Glendur, 8" x N/H, PSA | 5/pk |

### Nylon

A durable napless nylon weave. It provides excellent intermediate polishing on most materials

| Cat. # | Description | Pack |
|---|---|---|
| **50314-05** | Nylon, 8" x N/H, PSA | 5/pk |
| **50314-15** | Nylon, 8"x 2½", PSA | 5/pk |

### Glenco***

This flocked cloth is made by binding a rayon flock to a woven cotton backing; it is the most popular in our line. It is excellent for Final polishing when used in conjunction with diamond or alumina polishing compounds.

| Cat. # | Description | Pack |
|---|---|---|
| **50318-05** | Glenco, 8" x N/H, PSA | 5/pk |
| **50318-15** | Glenco, 8"x 2½", PSA | 5/pk |

### Spec-Cloth***

A long napped rayon flock with a plastic barrier. This is a finer version of our Glenco cloth especially designed for superior final polishing. For best results, use with our diamond polishing compound.

| Cat. # | Description | Pack |
|---|---|---|
| **50320-05** | Spec-Cloth, 8" x N/H, PSA | 5/pk |
| **50320-15** | Spec-Cloth, 8"x 2½", PSA | 5/pk |

### Silk**

100% pure woven silk for intermediate, final, or skid polishing on friable materials.

| Cat. # | Description | Pack |
|---|---|---|
| **50312-05** | Silk, 10" x N/H, PB | 5/pk |

### Final B*

This cloth has been especially designed for long life. Made from a rayon flock on a cotton canvas backing. It is recommended for all final polishing.

| Cat. # | Description | Pack |
|---|---|---|
| **50334-05** | Final B, 8" x N/H, PSA | 5/pk |
| **50334-15** | Final B, 8"x 2½", PSA | 5/pk |



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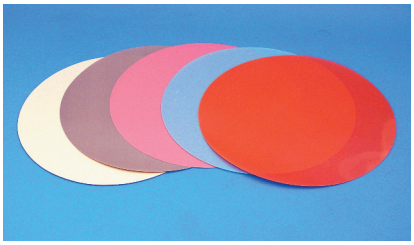
# SAMPLE PREPARATION & SUPPLIES

## Polishing and Lapping Supplies (continued)

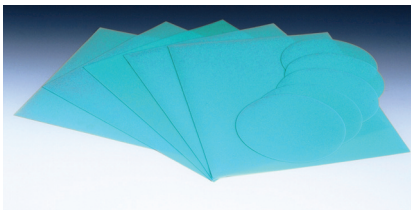
### Diamond Lapping Film



A selective diamond particle resin bonded to a uniform 3-mil polyester film backing. Excellent for polishing samples with differing hardness. Ideal for the preparation of cross sections for SEM/TEM analysis. Comes in 8" and 12" discs with a plain back (P/B) or pressure sensitive adhesive back (PSA).

| Diamond Lapping Film | | | | | |
|---|---|---|---|---|---|
| Micron | 8"xN/H P/B | 8"xN/H PSA | 12"xN/H P/B | 12"xN/H PSA | Pack |
| 0.1 | 50350-01 | 50351-01 | 50354-01 | 50355-01 | each |
| 0.25 | 50350-03 | 50351-03 | 50354-03 | 50355-03 | each |
| 0.5 | 50350-05 | 50351-05 | 50354-05 | 50355-05 | each |
| 1 | 50350-10 | 50351-10 | 50354-10 | 50355-10 | each |
| 3 | 50350-15 | 50351-15 | 50354-15 | 50355-15 | each |
| 6 | 50350-20 | 50351-20 | 50354-20 | 50355-20 | each |
| 9 | 50350-25 | 50351-25 | 50354-25 | 50355-25 | each |
| 15 | 50350-30 | 50351-30 | 50354-30 | 50355-30 | each |
| 30 | 50350-35 | 50351-35 | 50354-35 | 50355-35 | each |

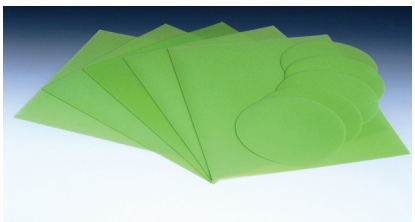
### Final Finishing Film



All films are 8" diameter, and available with either plain back (P/B) or pressure sensitive adhesive (PSA)

#### True Blue™ Film

True Blue™ film is produced with a proprietary process combining a unique mixture of abrasive particle sizes and shapes that are bonded to a film backing which enable the film to produce finer surfaces than are commonly found in similarly graded micron films. True Blue™ film is typically used after the 1micron diamond lapping film step and provides a flat, nearly scratch-free surface.

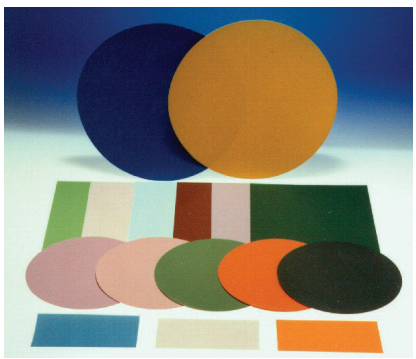


#### Final Green™ Film

Final Green™ film is produced using a unique process, which is different from any other type of abrasive film. This process produces a film that is capable of removing even the finest scratches at the final stage of polishing. Final Green™ film is typically used after True Blue™ film and produces an ideal sample surface for analysis.

| Final Finishing Film | 8" x P/B | 8" x PSA | Qty |
|---|---|---|---|
| True Blue™ Film | 50336-PB | 50336-PSA | each |
| Final Green™ Film | 50338-PB | 50338-PSA | each |

### Aluminum Oxide Abrasive Film Discs



Alumina is widely used in sample grinding and polishing. Our Aluminum Oxide Abrasive film with a PSA back or a plain back are ready to use in all sample polishing applications.

| Micron/Color | 8" Diameter Plain Back | 8" Diameter PSA Back | Qty |
|---|---|---|---|
| 0.05 - Pale Yellow | 50357-05 | 50358-05 | 25/pk |
| 0.3 - White | 50357-03 | 50358-03 | 25/pk |
| 1 - Purple | 50357-1 | 50358-1 | 25/pk |
| 3 - Mauve | 50357-3 | 50358-3 | 25/pk |
| 5 - Gray | 50357-5 | 50358-5 | 25/pk |
| 9 - Blue | 50357-9 | 50358-9 | 25/pk |
| 12 - Yellow Green | 50357-12 | 50358-12 | 25/pk |
| 20 - Tan | 50357-20 | 50358-20 | 25/pk |
| 30 - Green | 50357-30 | 50358-30 | 25/pk |

### Silicon Carbide Abrasive Film Discs

| Micron/Color | 8" Diameter Plain Back | 8" Diameter PSA Back | Qty |
|---|---|---|---|
| 1 | 50257-1 | 50258-1 | 25/pk |
| 3 | 50257-3 | 50258-3 | 25/pk |
| 5 | 50257-5 | 50258-5 | 25/pk |
| 9 | 50257-9 | 50258-9 | 25/pk |
| 15 | 50257-15 | 50258-15 | 25/pk |
| 30 | 50257-30 | 50258-30 | 25/pk |
| 60 | 50257-60 | 50258-60 | 25/pk |

# SAMPLE PREPARATION & SUPPLIES

## Polishing and Lapping Supplies (continued)

### Alumina Powder:

EMS's Alumina Powders are accurately controlled for all specs and particle size distribution, assuring you the best polishing results. The following micron sizes are available: 0.05, 0.3, and 1.0.

***TYPICAL APPLICATIONS:***

- Precision Optics
- Silicon Wafers
- Acrylic lenses
- Metallographic Sections
- Ferrite Components
- Electro-Optical Crystals
- Gem Stones

**Type DX Alumina Powder** is specially treated to reduce the number of agglomerates (group of particles in each grade of manufactured alumina). The result is fast polishing and improved quality of the finished products.

**Type N Alumina Powder** is recommended when these improvements are not necessary.

| Cat. # | Description | Size |
|---|---|---|
| 50360-01 | Type N, Alumina Powder, 0.05µm | 1 lb |
| 50360-05 | Type N, Alumina Powder, 0.3µm | 1 lb |
| 50360-10 | Type N, Alumina Powder, 1.0µm | 1 lb |
| 50361-01 | Type DX, Alumina Powder, 0.05µm | 1 lb |
| 50361-05 | Type DX, Alumina Powder, 0.3µm | 1 lb |
| 50361-10 | Type DX, Alumina Powder, 1.0µm | 1 lb |

### Alumina Slurry

These suspensions are water-based and contain no additives, which may interfere with polishing or contaminate the sample. All slurries are very stable and alumina is evenly dispersed. Excellent for the finest finishes

| Cat. # | Description | Size |
|---|---|---|
| 50368-10 | Alumina Slurry, 0.05µm | 6 oz |
| 50368-20 | Alumina Slurry, 0.3µm | 6 oz |
| 50368-30 | Alumina Slurry, 1.0µm | 6 oz |

### Colloidal Alumina

As an acidic dispersion, Colloidal Alumina is a chemical-mechanical action, that provides superior surfaces on germanium, silicon, gallium arsenide, zinc sulphide, fluorides, sapphire, ferrite's and silicon carbide. Low scatter finishes can be obtained on pure metals such as nickel, tungsten, copper, beryllium, steel and aluminum. Epoxy resin materials and plastics have also been successfully polished with this versatile colloidal dispersion.

**Properties:** pH: 3 - 3.5; solids: 20%; viscosity: thixotropic.

**Application:** Depending upon the application, Colloidal Alumina can be used full strength or diluted. Dilution up to 1:1 or higher with deionized water is recommended. Polyurethane and short nap cloths are recommended. However, most commonly used laps and pads are compatible with colloidal alumina.

| | | |
|---|---|---|
| 50365-05 | Colloidal Alumina | 1 pt |
| 50365-06 | Colloidal Alumina | 1 gal |

### Aluminum Oxide Powder - $Al_2O_3$

These are abrasive powders that are prepared from aluminum oxide, offering excellent coarse and intermediate polishing, with fast results.

| Cat. # | Description | Size |
|---|---|---|
| 50362-03 | Aluminum Oxide Powder, 3.0µm | 1 lb |
| 50362-05 | Aluminum Oxide Powder, 5.0µm | 1 lb |
| 50362-09 | Aluminum Oxide Powder, 9.0µm | 1 lb |
| 50362-15 | Aluminum Oxide Powder, 15.0µm | 1 lb |

### Boron Carbide Powder ($B_4C$)

Boron Carbide is one of the hardest materials known, ranking third behind diamond and cubic boron nitride.

- Extreme hardness, (Knoop 100g: 2900-3580 kg/mm²)
- Good chemical resistance
- Good nuclear properties
- Low density (2.52 g/cm²)

Due to the hardness, boron carbide powder is used as an abrasive in polishing and lapping applications.

| Cat. # | Description | Qty |
|---|---|---|
| 50510-08 | Boron Carbide Powder, 8µm | 1 lb |
| 50510-10 | Boron Carbide Powder, 10µm | 1 lb |
| 50510-14 | Boron Carbide Powder, 14µm | 1 lb |
| 50510-18 | Boron Carbide Powder, 18µm | 1 lb |
| 50510-23 | Boron Carbide Powder, 23µm | 1 lb |
| 50510-35 | Boron Carbide Powder, 35µm | 1 lb |
| 50510-42 | Boron Carbide Powder, 42µm | 1 lb |
| 50510-50 | Boron Carbide Powder, 50µm | 1 lb |

### Colloidal Silica

This non-crystallizing Colloidal Silica is made to be user friendly. It eliminates the problems that are caused by drying or freezing that are associated with other colloidal silica products which are used for chemical/mechanical polishing.

Colloidal silica is a first choice silica dispersion for optimizing polishing results such as silicon, fused quartz, fused silica, lithium niobate, YAZ, GGG, alexandrite, sapphire and many others.

**Properties:** pH: 9.6 - 9.9; Particle size: 20-60 nm;
Solids: 40%; Viscosity: 20-40 cp.

**Application:** Colloidal silica can be used full strength or diluted. Dilution to 1:1 or higher with deionized water is recommended. Polyurethane and short nap cloths can be used.

| | | |
|---|---|---|
| 50366-05 | Colloidal Silica | 1 pt |
| 50366-06 | Colloidal Silica | 1 gal |

### Silicon Carbide Powder SiC

Dark gray 98% SiC. Hardness, Moh's scale 9.0; Knoop Scale 2500. Crystallography: hexagonal – alpha and beta phase.

| Cat. # | Description | Qty |
|---|---|---|
| 50260-8 | Silicon Carbide Powder, 8µm | 1lb |
| 50260-10 | Silicon Carbide Powder, 10µm | 1lb |
| 50260-14 | Silicon Carbide Powder, 14µm | 1lb |
| 50260-18 | Silicon Carbide Powder, 18µm | 1lb |
| 50260-23 | Silicon Carbide Powder, 23µm | 1lb |
| 50260-35 | Silicon Carbide Powder, 35µm | 1lb |
| 50260-42 | Silicon Carbide Powder, 42µm | 1lb |
| 50260-50 | Silicon Carbide Powder, 50µm | 1lb |



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# Diamond Compounds

With great experience, technical knowledge, and modern facilities, we are able to manufacture superior diamond compounds and provide reliable service to every one.

Glennel® diamond products are specially formulated to help you prepare surfaces that are usually difficult to polish and require precision finish. To satisfy today's demand the diamond compounds must be complex with near perfect tolerances as is ours.

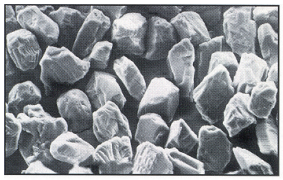

## Types of Diamond:

We use three basic types of diamonds: natural monocrystalline, synthetic monocrystalline, and synthetic polycrystalline. Typical sizes range from 1/10µm to 60µm

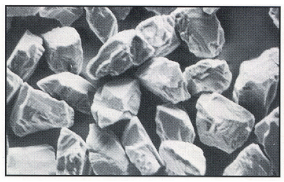
**MONOCRYSTALLINE** diamonds provide a cost effective means for good stock removal and finish. The natural form has a blocky shape with a smooth surface. Synthetic diamonds have a slightly irregular shape with multiple edges. Precision grading and high quality standards guarantee consistent shape and size. This consistency and unique shape make this a popular diamond for many production-lapping applications.

**POLYCRYSTALLINE** diamonds are recommended for microscopy, materialography, and where surface finish is extremely critical. We use the highest quality polycrystalline diamonds, Dupont Mypolex(r). It has a uniform blocky shape with a rough surface. Precision micro fractures built into each particle provide uniform and consistent fracturing under stress.

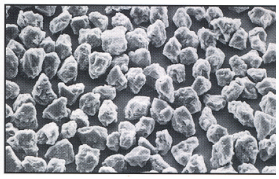
### Ultra-Precision Grading and Shaping of all Micron Sizes



Virgin Natural – Monocrystalline



Synthetic – Monocrystalline



Synthetic – Polycrystalline

## 1. Diamond Paste

**Glennel® UB Formulation** is excellent for most applications where a diamond compound is desired. It is soluble in either water or oil and works with all common extenders. UB compound is recommended for polishing laboratory specimens and lapping of materials such as carbide, ceramic, sapphire, composites, ferrite, and silicon.

**Glennel® UC Formulation** is an oil soluble compound recommended for finishing wire dies, molds, cold heading dies, and general shop applications where diamond compounds are required. UC provides fast cutting action and superior finish. Meant to be used with our Formula C extender for maximum efficiency.

**Glennel® OS Formulation** is an oil soluble compound designed for lapping large areas of hard material. Use alone or with an extender it cleans up easily, provides aggressive stock removal and an outstanding finish.

| Recommended for Use | Micron Size | Micron Size Range | Approx. Mesh Equivalent |
|---|---|---|---|
| Finest finishes for work of the highest precision. Used for optical, metallographic, ferrite, laser rod, and semiconductor finishing. | 0.1 | 0 - 0.2 | 240,000 |
| | 0.25 | 0 - 0.5 | 100,000 |
| | 0.5 | 0 - 1 | 60,000 |
| | 1 | 0 - 2 | 14,000 |
| | 2 | 1 - 3 | 11,000 |
| Final finish for most applications: molds, dies, general flat lapping. Preparatory lapping. Intermediate finish to achieve dimensions. | 3 | 2 - 4 | 8,000 |
| | 6 | 4 - 8 | 3,000 |
| | 9 | 8 - 12 | 1,800 |
| | 15 | 12 - 22 | 1,200 |
| | 30 | 22 - 36 | 600 |
| Fast stock removal and roughing on hardest materials | 45 | 36 - 54 | 325 |
| | 60 | 54 - 80 | 230/235 |
| | Mesh | - | 170/230 |

**Ordering:** All Diamond Pastes are available as a standard in 5 g size dispensing tube UB or UC and UBS or UCS. 18 g sizes are available upon request.

**Formulation Type:**

| Monocrystalline | | Polycrystalline |
|---|---|---|
| UB..... | Water & Oil | .....UBS |
| UC..... | Oil | .....UCS |
| OS..... | Oil | .....OSS |

**UB - Water/Oil Soluble (Monocrystalline)**

| Cat. # | Paste Diamond Compound | Size |
|---|---|---|
| **50370-10** | 0.1µm UB | 5 g |
| **50370-20** | 0.25µm UB | 5 g |
| **50370-30** | 0.5µm UB | 5 g |
| **50370-40** | 1.0µm UB | 5 g |
| **50370-50** | 3.0µm UB | 5 g |
| **50370-60** | 6.0µm UB | 5 g |
| **50370-70** | 9.0µm UB | 5 g |
| **50370-80** | 15.0µm UB | 5 g |

**UC- Oil Soluble (Monocrystalline)**

| | | |
|---|---|---|
| **50371-10** | 0.1µm UC | 5 g |
| **50371-20** | 0.25µm UC | 5 g |
| **50371-30** | 0.5µm UC | 5 g |
| **50371-40** | 1.0µm UC | 5 g |
| **50371-50** | 3.0µm UC | 5 g |
| **50371-60** | 6.0µm UC | 5 g |
| **50371-70** | 9.0µm UC | 5 g |
| **50371-80** | 15.0µm UC | 5 g |

**UBS - Water/Oil Soluble (Polycrystalline)**

| | | |
|---|---|---|
| **50370-11** | 0.1µm UBS | 5 g |
| **50370-21** | 0.25µm UBS | 5 g |
| **50370-31** | 0.5µm UBS | 5 g |
| **50370-41** | 1.0µm UBS | 5 g |
| **50370-51** | 3.0µm UBS | 5 g |
| **50370-61** | 6.0µm UBS | 5 g |
| **50370-71** | 9.0µm UBS | 5 g |
| **50370-81** | 15.0µm UBS | 5 g |
| **50370-91** | 30.0µm UBS | 5 g |

**UCS- Oil Soluble (Polycrystalline)**

| | |
|---|---|
| **50371-11** | Please see 50370 |

# SAMPLE PREPARATION & SUPPLIES

## Polishing and Lapping Supplies (continued)

### Diamond Compounds (continued)


#### 2. Diamond Suspension

Glennel® Diamond Suspension assures a consistent, uniform viscosity and dispersion of diamond without any shaking or stirring. The proprietary formulation guarantees that the particles will stay suspended indefinitely. It is ideal for automatic polishers and applications that require changing operators.

A versatile, water based suspension designed for most production applications. This special formulation provides:

- **Excellent lubrication**
- **Uniform fast lapping action**
- **Maximum cutting action**
- **Compatible with all common extenders.**

**Ordering:** All Diamond Suspensions are packed in 400g bottles and have Medium Concentration prepared with Premium Polycrystalline Diamond in either Propylene Glycol (Oil based) or Water based formulas

| Diamond Particle Size | Oil Based Cat. # | Water Based Cat. # |
|---|---|---|
| 0.01µm (240,000 mesh) | **50372-10** | **50372-11** |
| 0.25µm (100,000 mesh) | **50372-20** | **50372-21** |
| 0.5µm (60,000 mesh) | **50372-30** | **50372-31** |
| 1.0µm (14,000 mesh) | **50372-40** | **50372-41** |
| 3.0µm (8,000 mesh) | **50372-60** | **50372-61** |
| 6.0µm (3,000 mesh) | **50372-70** | **50372-71** |
| 9.0µm (100,000 mesh) | **50372-80** | **50372-81** |
| 15.0µm (1,200 mesh) | **50372-90** | **50372-91** |

#### 3. Diamond Spray

Glennel® Diamond Aerosol Spray provides unsurpassed cutting action and finish. The inverted nozzle provides safe and easy access for difficult to reach areas while ensuring that every diamond particle is used. Special formulations allow the carrier to evaporate quickly, leaving a very uniform dispersion of diamond. This is especially useful when an operation requires a dry polishing cloth.

**Ordering:** Our Diamond Spray is available in 5 oz cans.

| Diamond Particle Size | Polycrystalline Cat. # |
|---|---|
| 0.25µm (100.000 mesh) | **50374-06** |
| 0.5µm (60,000 mesh | **50374-10** |
| 1.0µm (14,000 mesh) | **50374-11** |
| 3.0µm (8,000 mesh) | **50374-16** |
| 6.0µm (3,000 mesh) | **50374-21** |
| 9.0µm (1,800 mesh) | **50374-26** |
| 15.0µm (1,200 mesh) | **50374-31** |

#### 4. Lapping Solutions

- **Glenoil Lube - Lapping vehicle is the ideal lap oil for all Glennel® UB Compounds and Diamond Sprays. It assures continued separation of diamond particles and constant removal of lap debris.**
- **Formula C is made especially for oil soluble compounds, such as Glennel® UC and US listed above. This penetrating formula is specially designed to enhance cutting action and leave a superior finish**
- **Formula B is a universal lapping vehicle, compatible with both water and oil soluble compounds. It is ideal in an environment where materials change constantly. This very versatile formulation allows you to change materials and compounds and still provides excellent lubricity and cutting action.**

| Cat. # | Description | Qty |
|---|---|---|
| **50376-01** | Glenoil Lube | 16 oz |
| **50376-05** | Formula C Lube | 16 oz |
| **50376-10** | Formula B Lube | 16 oz |

### Diamond Powder

Made from synthetic diamond.

| Cat. # | Description | Qty |
|---|---|---|
| **50375-01** | Diamond Powder, 0.1µm | 10 carats |
| **50375-02** | Diamond Powder, 0.25µm | 10 carats |
| **50375-05** | Diamond Powder, 0.5µm | 10 carats |
| **50375-1** | Diamond Powder, 1µm | 10 carats |
| **50375-3** | Diamond Powder, 3µm | 10 carats |
| **50375-6** | Diamond Powder, 6µm | 10 carats |
| **50375-9** | Diamond Powder, 9µm | 10 carats |
| **50375-15** | Diamond Powder, 15µm | 10 carats |
| **50375-30** | Diamond Powder, 30µm | 10 carats |
| **50375-45** | Diamond Powder, 45µm | 10 carats |



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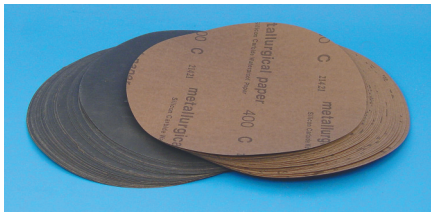
# SAMPLE PREPARATION & SUPPLIES

## Grinding and Sectioning Supplies

### Premium Pregrinding Wet or Dry Abrasive Papers (Discs)



We offer the finest wet or dry abrasive discs for sample preparation with the following features:

- **Premium Resin Bonding System for longer wear rates as well as for wet or dry operation.**
- **Special adhesive on PSA* backed discs that eliminates the need to transfer to plates.**
- **Uniform mineral size.**
- **Pull tabs on all PSA backed discs for easy use.**
- **Large labels for easy product identification.**

* PSA: Pressure Sensitive Adhesive

Available in 9 different grit sizes, ranging from coarse to fine, on plain back or water resistant pressure sensitive adhesive back. Available in 8" diameter discs as a standard, and 12" discs available upon request.

| 8" (203mm) Silicon Carbide Discs (SCD), Wet or Dry Plain Back | | |
|---|---|---|
| **50250-01** | 8" SCD, Plain Back, 60 Grit | 25/Bx |
| **50250-03** | 8" SCD, Plain Back, 120 Grit | 25/bx |
| **50250-04** | 8" SCD, Plain Back, 180 Grit | 25/bx |
| **50250-05** | 8" SCD, Plain Back, 240 Grit | 25/bx |
| **50250-06** | 8" SCD, Plain Back, 320 Grit | 25/bx |
| **50250-07** | 8" SCD, Plain Back, 400 Grit | 25/bx |
| **50250-08** | 8" SCD, Plain Back, 600 Grit | 25/bx |
| **50250-09** | 8" SCD, Plain Back, 800 Grit | 25/bx |
| **50250-10** | 8" SCD, Plain Back, 1200 Grit | 25/bx |

| 8" (203mm) Silicon Carbide Discs(SCD), Wet or Dry PSA Back | | |
|---|---|---|
| **50255-01** | 8" SCD, PSA Back, 60 Grit | 25/bx |
| **50255-03** | 8" SCD, PSA Back, 120 Grit | 25/bx |
| **50255-04** | 8" SCD, PSA Back, 180 Grit | 25/bx |
| **50255-05** | 8" SCD, PSA Back, 240 Grit | 25/bx |
| **50255-06** | 8" SCD, PSA Back, 320 Grit | 25/bx |
| **50255-07** | 8" SCD, PSA Back, 400 Grit | 25/bx |
| **50255-08** | 8" SCD, PSA Back, 600 Grit | 25/bx |
| **50255-09** | 8" SCD, PSA Back, 800 Grit | 25/bx |
| **50255-10** | 8" SCD, PSA Back, 1200 Grit | 25/bx |

## Sectioning:

### Flexible Diamond Discs

Grit Pattern Example

Flexible Diamond Discs will reduce the number of steps in the grinding/polishing process along with a decrease in preparation time. Our Flexible Diamond Discs replace traditional SiC discs for most applications and give a superior finish and perfectly flat specimens. The patterned design minimizes build up of abraded material.

They come just PSA backed, but one can add a steel plate backing, as well as a magnetic backing.

### PSA Backed Discs Only

| Cat. No. | Grit | Size | Pack |
|---|---|---|---|
| **50270-01** | 60 | 8" | each |
| **50270-02** | 60 | 10" | each |
| **50270-03** | 60 | 12" | each |
| **50270-04** | 80 | 8" | each |
| **50270-05** | 80 | 10" | each |
| **50270-06** | 80 | 12" | each |
| **50270-07** | 120 | 8" | each |
| **50270-08** | 120 | 10" | each |
| **50270-09** | 120 | 12" | each |
| **50270-10** | 220 | 8" | each |
| **50270-11** | 220 | 10" | each |
| **50270-12** | 220 | 12" | each |
| **50270-13** | 320 | 8" | each |
| **50270-14** | 320 | 10" | each |
| **50270-15** | 320 | 12" | each |
| **50270-16** | 400 | 8" | each |
| **50270-17** | 400 | 10" | each |
| **50270-18** | 400 | 12" | each |
| **50270-19** | 800 | 8" | each |
| **50270-20** | 800 | 10" | each |
| **50270-21** | 800 | 12" | each |
| **50270-22** | 1500 | 8" | each |
| **50270-23** | 1500 | 10" | each |
| **50270-24** | 1500 | 12" | each |

### PSA Backed Discs Plus Steel Plate Backing

| Cat. No. | Grit | Size | Pack |
|---|---|---|---|
| **50280-01** | 60 | 8" | each |
| **50280-02** | 60 | 10" | each |
| **50280-03** | 60 | 12" | each |
| **50280-04** | 80 | 8" | each |
| **50280-05** | 80 | 10" | each |
| **50280-06** | 80 | 12" | each |
| **50280-07** | 120 | 8" | each |
| **50280-08** | 120 | 10" | each |
| **50280-09** | 120 | 12" | each |
| **50280-10** | 220 | 8" | each |
| **50280-11** | 220 | 10" | each |
| **50280-12** | 220 | 12" | each |
| **50280-13** | 320 | 8" | each |
| **50280-14** | 320 | 10" | each |
| **50280-15** | 320 | 12" | each |
| **50280-16** | 400 | 8" | each |
| **50280-17** | 400 | 10" | each |
| **50280-18** | 400 | 12" | each |
| **50280-19** | 800 | 8" | each |
| **50280-20** | 800 | 10" | each |
| **50280-21** | 800 | 12" | each |
| **50280-22** | 1500 | 8" | each |
| **50280-23** | 1500 | 10" | each |
| **50280-24** | 1500 | 12" | each |

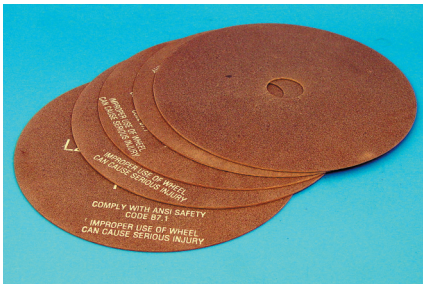
### PSA Backed Discs Plus Steel Plate and Magnetic Backing

| Cat. No. | Grit | Size | Pack |
|---|---|---|---|
| **50290-01** | 60 | 8" | each |
| **50290-02** | 60 | 10" | each |
| **50290-03** | 60 | 12" | each |
| **50290-04** | 80 | 8" | each |
| **50290-05** | 80 | 10" | each |
| **50290-06** | 80 | 12" | each |
| **50290-07** | 120 | 8" | each |
| **50290-08** | 120 | 10" | each |
| **50290-09** | 120 | 12" | each |
| **50290-10** | 220 | 8" | each |
| **50290-11** | 220 | 10" | each |
| **50290-12** | 220 | 12" | each |
| **50290-13** | 320 | 8" | each |
| **50290-14** | 320 | 10" | each |
| **50290-15** | 320 | 12" | each |
| **50290-16** | 400 | 8" | each |
| **50290-17** | 400 | 10" | each |
| **50290-18** | 400 | 12" | each |
| **50290-19** | 800 | 8" | each |
| **50290-20** | 800 | 10" | each |
| **50290-21** | 800 | 12" | each |
| **50290-22** | 1500 | 8" | each |
| **50290-23** | 1500 | 10" | each |
| **50290-24** | 1500 | 12" | each |

# SAMPLE PREPARATION & SUPPLIES

## Grinding and Sectioning Supplies (continued)

### Premium Abrasive Cut-off Wheels for Sectioning




Aluminum Oxide and Silicon Carbide Abrasive Cut-Off Wheels are offered for long life, and are affordably priced for various sectioning requirements. All wheels are 9" (228.6mm) diameter ,0.062"(1.6mm) thick; 1¼" (31mm) arbor.

**9" Diameter Cut-off Wheel**

| Cat. # | Description/ Application | Abrasive | Packed |
|---|---|---|---|
| **50209-05** | Hard Steel Rc 60+ | $Al_2O_3$ | 5/bx |
| **50209-10** | Medium Steel Rc 45-60 | $Al_2O_3$ | 5/bx |
| **50209-15** | Soft Steel Rc 30-45 | $Al_2O_3$ | 5/bx |
| **50209-20** | Hard Non-Ferrous, Titanium | SiC | 5/bx |
| **50209-25** | Med Non-Ferrous, Titanium | SiC | 5/bx |
| **50209-30** | Soft Non-Ferrous, Titanium | SiC | 5/bx |

**For General Purpose, 5" Diameter Cut-Off Wheel** (Silicon/Carbide) is the most common disc.

| | | |
|---|---|---|
| **50205-10** | 5" General Purpose Cut-Off Wheel | 10/pk |

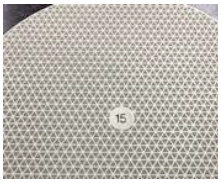
### Diamond Discs

Dialok (Diamond Discs consists of a flat, stainless steel backing with sharp, blocky diamond particles electroformed onto the disc. The special hard nickel alloy that is used in Dialok is bonded rigidly and it locks the diamond particles in the disc thus providing fast cutting of all hard materials. The sharp particles cut cleanly with no edge rounding. The discs are supplied with pressure sensitive adhesive backing (PSA).

**8" (203mm) (PSA) xN/H; Full Coat**

| | | | | | |
|---|---|---|---|---|---|
| **50345-06** | 6 micron | each | **50345-30** | 30 micron | each |
| **50345-09** | 9 micron | each | **50345-45** | 45 micron (280 mesh) | each |
| **50345-15** | 15 micron | each | **50345-75** | 75 micron (220 mesh) | each |

### PremaDisk S-EC Diamond Grinding Discs



*Replacement for Piano, Cameo, Galaxy, Apex DGD*

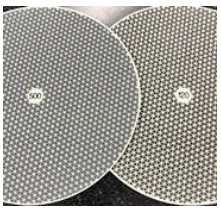
These new grinding pads will replace 200-300 SiC paper discs saving you not only preparation tine, but also money.

#### FEATURES

- 40% diamond concentration
- Hard resin bond system
- 0.2 mm thickness
- Fast and clean mounting
- Universal grinding applications
- For all magnetic systems
- High surface quality
- Very high stock removal rate
- Non-erosion backing
- Only water coolant needed

| Cat. No. | Grit | Diameter | Pack | Cat. No. | Grit | Diameter | Pack | Cat. No. | Grit | Diameter | Pack |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **50292-01** | 60 µm | 200 mm | each | **50292-08** | 30 µm | 350 mm | each | **50292-15** | 6 µm | 300 mm | each |
| **50292-02** | 60 µm | 250 mm | each | **50292-09** | 15 µm | 200 mm | each | **50292-16** | 6 µm | 350 mm | each |
| **50292-03** | 60 µm | 300 mm | each | **50292-10** | 15 µm | 250 mm | each | **50292-17** | 3 µm | 200 mm | each |
| **50292-04** | 60 µm | 350 mm | each | **50292-11** | 15 µm | 300 mm | each | **50292-18** | 3 µm | 250 mm | each |
| **50292-05** | 30 µm | 200 mm | each | **50292-12** | 15 µm | 350 mm | each | **50292-19** | 3 µm | 300 mm | each |
| **50292-06** | 30 µm | 250 mm | each | **50292-13** | 6 µm | 200 mm | each | **50292-20** | 3 µm | 350 mm | each |
| **50292-07** | 30 µm | 300 mm | each | **50292-14** | 6 µm | 250 mm | each | | | | |

### PremaDisk S-SiC Grinding Discs



We are proud to introduce these grinding disks made with silicon carbide grains. They are designed with a flat grain curve that will not flatten after a few applications. They are a good alternative to SiC abrasive paper and SiC grinding foils (films), lasting 50-100 times longer. Grinding disks come with a self-adhesive backing.

#### FEATURES

- 60% SiC concentration
- Hard resin bond system
- 0.4 mm thickness
- Fast mounting
- Universal applications
- Consistent stock removal rate
- For all mounting systems
- Wet or dry applications

| Cat. No. | Grit | Diameter | Pack | Cat. No. | Grit | Diameter | Pack | Cat. No. | Grit | Diameter | Pack |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **50291-01** | 120 | 200 mm | each | **50291-06** | 220 | 300 mm | each | **50291-11** | 800 | 250 mm | each |
| **50291-02** | 120 | 250 mm | each | **50291-07** | 500 | 200 mm | each | **50291-12** | 800 | 300 mm | each |
| **50291-03** | 120 | 300 mm | each | **50291-08** | 500 | 250 mm | each | **50291-13** | 1200 | 200 mm | each |
| **50291-04** | 220 | 200 mm | each | **50291-09** | 500 | 300 mm | each | **50291-14** | 1200 | 250 mm | each |
| **50291-05** | 220 | 250 mm | each | **50291-10** | 800 | 200 mm | each | **50291-15** | 1200 | 300 mm | each |



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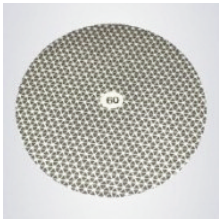
## PremaDisk SM and SH Flexible Diamond Grinding Discs



PremaDisk Flexible Diamond Grinding Discs offer superior surface finishes that are usually only seen in lapping processes.

The SM disc is a medium-hard resin bond base for fine grinding and polishing of metals, ceramics and glass.

The SH disc is a hard resin bond base for applications where a very sharp edge must be maintained on the workpiece.

Both discs increase productivity by combining optimum surface quality, removal rates, and tool life in the same process.

### SPECIFICATIONS

| | |
|---|---|
| **Grinding Pressure** | 5-7 N/cm² for steel and comperable materials<br>13 N/cm² for ceramics |
| **Maximum Speed** | 15 m/s |
| **Coolant** | Water |

### PremaDisk SM Flexible Diamond Grinding Discs

| Cat. No. | Grit | Diameter | Pack |
|---|---|---|---|
| **50293-01** | 60 µm | 200 mm | each |
| **50293-02** | 60 µm | 250 mm | each |
| **50293-03** | 60 µm | 300 mm | each |
| **50293-04** | 60 µm | 350 mm | each |
| **50293-05** | 30 µm | 200 mm | each |
| **50293-06** | 30 µm | 250 mm | each |
| **50293-07** | 30 µm | 300 mm | each |
| **50293-08** | 30 µm | 350 mm | each |
| **50293-09** | 15 µm | 200 mm | each |
| **50293-10** | 15 µm | 250 mm | each |
| **50293-11** | 15 µm | 300 mm | each |
| **50293-12** | 15 µm | 350 mm | each |
| **50293-13** | 6 µm | 200 mm | each |
| **50293-14** | 6 µm | 250 mm | each |
| **50293-15** | 6 µm | 300 mm | each |
| **50293-16** | 6 µm | 350 mm | each |
| **50293-17** | 3 µm | 200 mm | each |
| **50293-18** | 3 µm | 250 mm | each |
| **50293-19** | 3 µm | 300 mm | each |
| **50293-20** | 3 µm | 350 mm | each |

### PremaDisk SH Flexible Diamond Grinding Discs

| Cat. No. | Grit | Diameter | Pack |
|---|---|---|---|
| **50294-01** | 60 µm | 200 mm | each |
| **50294-02** | 60 µm | 250 mm | each |
| **50294-03** | 60 µm | 300 mm | each |
| **50294-04** | 60 µm | 350 mm | each |
| **50294-05** | 30 µm | 200 mm | each |
| **50294-06** | 30 µm | 250 mm | each |
| **50294-07** | 30 µm | 300 mm | each |
| **50294-08** | 30 µm | 350 mm | each |
| **50294-09** | 15 µm | 200 mm | each |
| **50294-10** | 15 µm | 250 mm | each |
| **50294-11** | 15 µm | 300 mm | each |
| **50294-12** | 15 µm | 350 mm | each |
| **50294-13** | 6 µm | 200 mm | each |
| **50294-14** | 6 µm | 250 mm | each |
| **50294-15** | 6 µm | 300 mm | each |
| **50294-16** | 6 µm | 350 mm | each |
| **50294-17** | 3 µm | 200 mm | each |
| **50294-18** | 3 µm | 250 mm | each |
| **50294-19** | 3 µm | 300 mm | each |
| **50294-20** | 3 µm | 350 mm | each |

## PremaDisk Cleaning Stone

*For use with PremaDisk Diamond Grinding Discs*

| Cat No. | Description | Qty. |
|---|---|---|
| **50298** | PremaDisk Cleaning Stone, 100 x 20 x 20 mm | each |

## Polishing Discs

*PremaDisk Opto Series Composite Polishing Discs*

### Metal Resin Polishing Discs

| Cat No. | Description | Qty. |
|---|---|---|
| **50295-01** | Metal Resin Polishing Disc, 8" | each |
| **50295-02** | Metal Resin Polishing Disc,10" | each |
| **50295-03** | Metal Resin Polishing Disc,12" | each |
| **50295-04** | Metal Resin Polishing Disc w/metal backing, 8" | each |
| **50295-05** | Metal Resin Polishing Disc w/metal backing, 10" | each |
| **50295-06** | Metal Resin Polishing Disc w/metal backing, 12" | each |

### Copper Resin Polishing Discs

| Cat No. | Description | Qty. |
|---|---|---|
| **50296-01** | Copper Resin Polishing Disc, 8" | each |
| **50296-02** | Copper Resin Polishing Disc, 10" | each |
| **50296-03** | Copper Resin Polishing Disc, 12" | each |
| **50296-04** | Copper Resin Polishing Disc w/metal backing, 8" | each |
| **50296-05** | Copper Resin Polishing Disc w/metal backing, 10" | each |
| **50296-06** | Copper Resin Polishing Disc w/metal backing, 12" | each |

### Tin Resin Polishing Discs

| Cat No. | Description | Qty. |
|---|---|---|
| **50297-01** | Tin Resin Polishing Disc, 8" | each |
| **50297-02** | Tin Resin Polishing Disc, 10" | each |
| **50297-03** | Tin Resin Polishing Disc, 12" | each |
| **50297-04** | Tin Resin Polishing Disc w/metal backing, 8" | each |
| **50297-05** | Tin Resin Polishing Disc w/metal backing, 10" | each |
| **50297-06** | Tin Resin Polishing Disc w/metal backing, 12" | each |

# SAMPLE PREPARATION & SUPPLIES

## RELATED PRODUCTS...

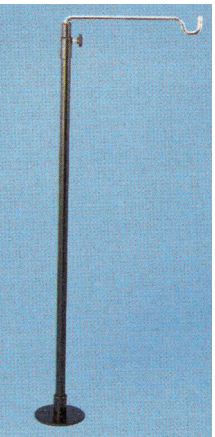
### Pro-Craft® Flexible Shaft Machine

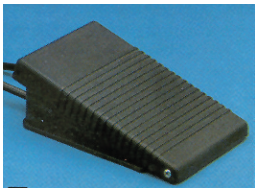
A versatile hang-up flexible shaft machine. Available either 1/10 or 1/8 HP, ball bearing motor, variable speed 0 – 18,000 RPM.

### Available with a wide range of accessories

- Electronic Foot Speed Controls
- Adjustable Flex Shaft Holder
- Flex Shaft Accessory Kits
- Unmounted Cut-Off Wheels

***For more information, see our Full Line Catalog or visit us at www.emsdiasum.com***





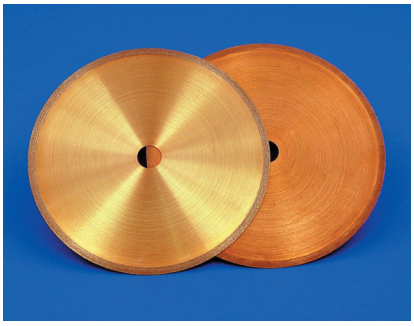
## Grinding and Sectioning Supplies (continued)

### Precision Diamond Wafering Blades

(Precision Diamond Cut-Off Wheels)

These bonded blades are constructed of an inner metal core and an outer rim, this rim is bonded with diamond particles. These blades come in high and low concentrations of diamond particles, to handle various sectioning requirements:

- **High Concentration (H/C) for general laboratory use, either low or high saw's speed.**
- **Low concentration (L/C) for sectioning hard and brittle materials, such as ceramics, silicon, glass, minerals.**



| Cat. # | Diameter | Thickness | Diamond Size | Diamond Concentration | Packed |
|---|---|---|---|---|---|
| 50265-FH3 | 3" | 0.006" | Fine | High | each |
| 50265-MH3 | 3" | 0.006" | Medium | High | each |
| 50265-ML3 | 3" | 0.006" | Medium | Low | each |
| 50266-MH3 | 3" | 0.010" | Medium | High | each |
| 50265-FH4 | 4" | 0.012" | Fine | High | each |
| 50265-MH4 | 4" | 0.012" | Medium | High | each |
| 50265-CH4 | 4" | 0.012" | Coarse | High | each |
| 50265-CL4 | 4" | 0.012" | Coarse | Low | each |
| 50266-FH4 | 4" | 0.015" | Fine | High | each |
| 50266-MH4 | 4" | 0.015" | Medium | High | each |
| 50266-CH4 | 4" | 0.015" | Coarse | High | each |

| Cat. # | Diameter | Thickness | Diamond Size | Diamond Concentration | Packed |
|---|---|---|---|---|---|
| 50267-FH4 | 4" | 0.020" | Fine | High | each |
| 50267-MH4 | 4" | 0.020" | Medium | High | each |
| 50267-CH4 | 4" | 0.020" | Coarse | High | each |
| 50265-MH5 | 5" | 0.015" | Medium | High | each |
| 50265-CH5 | 5" | 0.015" | Coarse | High | each |
| 50265-CL5 | 5" | 0.015" | Coarse | Low | each |
| 50265-CH6 | 6" | 0.020" | Coarse | High | each |
| 50265-CL6 | 6" | 0.020" | Coarse | Low | each |
| 50265-MH7 | 7" | 0.020" | Medium | High | each |
| 50265-CH7 | 7" | 0.020" | Coarse | High | each |
| 50266-CH7 | 7" | 0.029" | Coarse | High | each |
| 50266-CL7 | 7" | 0.029" | Coarse | Low | each |

### Diamond Wafering Blade

| Cat. # | Diameter | Thickness | Packed |
|---|---|---|---|
| 50265-04 | 4" | .14" W,.20"D | each |
| 50265-05 | 5" | .14" W,.20"D | each |
| 50265-06 | 6" | .14" W,.20"D | each |
| 50265-07 | 7" | .25" W, .276"D | each |
| 50266-04 | 4" | .20" W, .20"D | each |
| 50266-05 | 5" | .20" W,.20"D | each |
| 50266-06 | 6" | .20" W, .276"D | each |
| 50266-07 | 7" | .32" W, .276"D | each |
| 50267-06 | 6" | .32" W, .276"D | each |

### Water Soluble Coolant

Use with a dilution 25:1 with water to cool saw blade or belt during cutting.

| Cat No. | Description | Qty. |
|---|---|---|
| 50378-01 | Water Soluble Coolant | 1 qt |

### SiC Dressing Stick

Made from silicon carbide. Use for cutting blade dressing.

| Cat No. | Description | Qty. |
|---|---|---|
| 50379-01 | SiC Dressing Stick | 1 stick |



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Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

# AFM & STM SUPPLIES

**DIATOME AFM,** CROSS-SECTION MOUNTS & HOLDERS, **GOLD & SILVER COATED SUBSTRATES,** SPECIMEN DISCS, **SILICON WAFERS,** VACUUM SYSTEMS & TOOLS, **STORAGE BOXES & CONTAINERS,**


Electron Microscopy Sciences

www.emsdiasum.com

# AFM & STM SUPPLIES

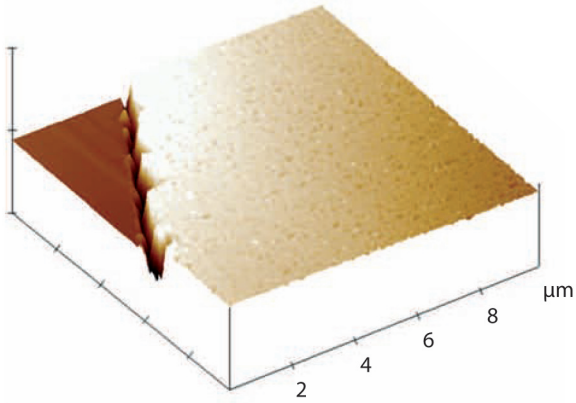

## *DiATOME* AFM For Ultra and Cryo

**Extremely smooth sample surfaces. Best possible structure preservation.**

The high quality Diatome diamond knives are not just perfect for producing ultrathin and semi-thin sections, but also for surfacing sectioning of all kinds of biological and industrial specimens for AFM investigation. Instead of a section as for TEM, the specimen surface is investigated using AFM. In order to achieve the best results for AFM investigation, only the highest quality diamond knives should be used. Diatome ultra AFM and cryo AFM knives are specially tested to ensure that they meet the increased quality requirements of AFM investigation. They produce extremely smooth sample surfaces and guarantee the best possible structure preservation. Available in 35° with a cutting range of 10-100 nm in 2mm and 3 mm sizes.

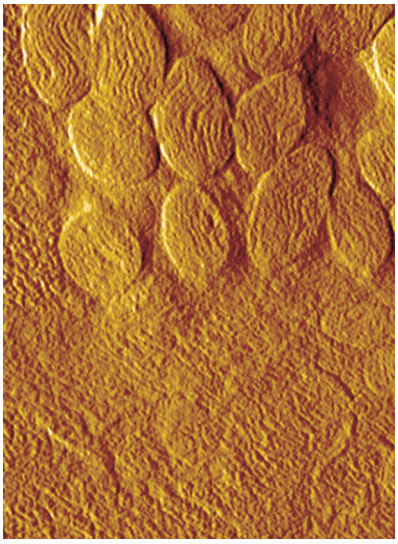
### Superconducting Oxide $Bi_2Sr_2Ca_1Cu_2O_8$ (BSCCO)

Sample surfaced with a Diatome ultra AFM diamond knife, feed 20nm.




| Digital Instruments Nanoscope | |
|---|---|
| Scan size | 9.785 µm |
| Scan rate | 1.489 Hz |
| Number of samples | 512 |
| Image Data | Height |
| Data scale | 1.000 µm |

X 2.000 µm/div
Z 1000.000 nm/div



AFM amplitude image of the muscle of cat's mite Otodectes cynotis. The contrast covers amplitude variation in the 1-3nm range. Size of the whole image equals 4.6microns. Nadejda Borisovna Matsko, Institut für angewandte Physik, ETH Zürich

### References

1. P.H. Vallotton, M.M. Denn, B.A. Wood and M.B. Salmeron: Comparison of medical-grade ultrahigh molecular weight polyethylene microstructure by AFM and TEM.
2. J. Biomater. Sci. Polymer Edn., Vol 6, No. 7, pp. 609-620, 1994. N. Matsko and M. Müller: AFM of biological material embedded in epoxi resin. Journal of Structural Biology 146, pp. 334-343, 2004.

## ORDERING INFORMATION

| Description | Angle | mm | Knife | Cat. No. |
|---|---|---|---|---|
| Cryo-AFM Diamond Knife | 35° | 2.0mm | new | **20-AFM-CDL** |
| | | | resharpen | **20-AFM-CDR** |
| Ultra-AFM Diamond Knife | 35° | 2.0mm | new | **20-AFM-UDL** |
| | | | resharpen | **20-AFM-UDR** |
| Cryo-AFM Diamond Knife | 35° | 3.0mm | new | **30-AFM-CDL** |
| | | | resharpen | **30-AFM-CDR** |
| Ultra-AFM Diamond Knife | 35° | 3.0mm | new | **30-AFM-UDL** |
| | | | resharpen | **30-AFM-UDR** |


74000-01


74000-02


74000-03


74000-04

## Cross Section Mounts and Sample Holders for AFM/STM

Made from high quality magnetic stainless steel

These mounts and sample holders make it easy to clamp and position cross sectional samples for AFM imaging. They're easy to attach to the magnetic sample holder of the AFM system.

Compatible with most AFM systems on the market.

| Cat. No. | Description | Qty. |
|---|---|---|
| **74000-01** | 90° Mount - Adhesive required | each |
| **74000-02** | 90° Mount with Spring Clip | each |
| **74000-03** | Vise w/Set Screw and Allen Key | each |
| **74000-04** | Dual Vise w/Set Screw and Allen Key | each |



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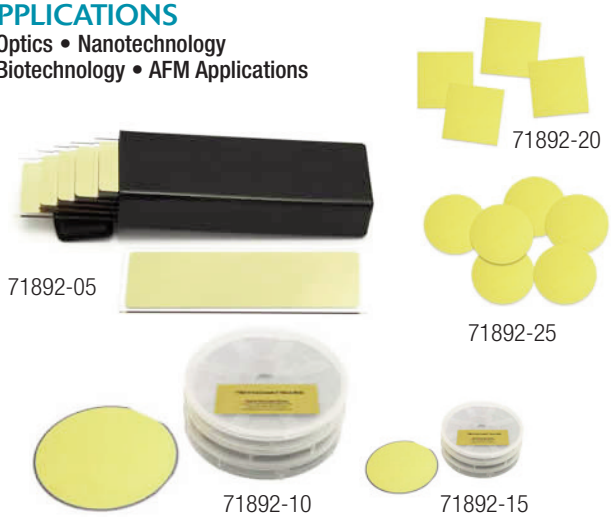
# Gold and Silver Substrates for AFM, STM

## EMS Gold Coated Substrates

EMS offers a variety of economically priced gold coated substrates. All coatings are deposited under vacuum using electron beam evaporation. These high quality substrates are coated with 500 Å (50 nm) of gold, with a thin chromium adhesion layer (2-7 nm) between the glass and gold coating. This adhesion layer can also be replaced with titanium upon request. All substrates are pre-cleaned using an ion source for quality assurance. Glass slides are packed in a dedicated cleanroom environment and shipped in slide mailers. All coverslips are packed in a dedicated cleanroom environment and shipped in a X0 Gel-Pak box. All gold substrates are autoclavable.

### APPLICATIONS

- Optics • Nanotechnology
- Biotechnology • AFM Applications




### SPECIFICATIONS

| | Microscope Slides | Silicon Wafers | Coverslips |
|---|---|---|---|
| **Type** | Soda lime glass | P/Boron | Borosilicate glass |
| **Density** | 2.48 g/cm$^3$ | ------- | 2.51 g/cm$^3$ |
| **Refractive Index** (λ=546.1 nm) | 1.517 | ------- | 1.525 |
| **Coating** | Gold, Au | Gold, Au | Gold, Au |
| **Coating Purity** | 99.999% | 99.999% | 99.999% |
| **Deposition Technique** | Electron Beam | Electron Beam | Electron Beam |
| **Deposition Rate** | 1-2 Å/sec | 1-2 Å/sec | 1-2 Å/sec |
| **Vapor Pressure** | 10$^{-6}$ Torr | 10$^{-6}$ Torr | 10$^{-6}$ Torr |
| **Orientation** | ------- | <100> | ------- |
| **Resistivity** | ------- | 1-50 ohm-cm | ------- |
| **Front Surface** | ------- | Polished | ------- |
| **Back Surface** | ------- | Etched | ------- |

### ORDERING INFORMATION

| Cat. No. | Description | Dimensions | Qty. |
|---|---|---|---|
| **71892-05** | Gold Coated Microscope Slide | 25 x 75 x 1 (mm) | each |
| **71892-10** | Gold Coated 4" Silicon Wafer, P-Type <100> | 100 mm dia., 0.525 mm th. | each |
| **71892-15** | Gold Coated 2" Silicon Wafer, P-Type <100> | 50 mm dia., 0.279 mm th. | each |
| **71892-20** | Gold Coated Square Coverslips | 22 x 22 x 0.2 (mm) | 2/pk |
| **71892-25** | Gold Coated Round Coverslips | 16 mm dia., 0.15 mm | 2/pk |

## EMS Silver Coated Substrates

EMS offers a variety of economically priced silver coated substrates. All coatings are deposited under vacuum using electron beam evaporation. These high quality substrates are coated with 500 Å (50 nm) of silver, with a thin titanium adhesion layer (2-7 nm) between the glass and silver coating. This adhesion layer can also be replaced with chromium upon request. All substrates are pre-cleaned using an ion source for quality assurance. Glass slides are packed in a dedicated cleanroom environment and shipped in slide mailers. All coverslips are packed in a dedicated cleanroom environment and shipped in a X0 Gel-Pak box.

### APPLICATIONS

**Optics • Nanotechnology • Reflectometry • AFM Applications**


### SPECIFICATIONS

| | Microscope Slides | Silicon Wafers | Coverslips |
|---|---|---|---|
| **Type** | Soda lime glass | P/Boron | Borosilicate glass |
| **Density** | 2.48 g/cm$^3$ | ------- | 2.51 g/cm$^3$ |
| **Refractive Index** (λ=546.1 nm) | 1.517 | ------- | 1.525 |
| **Coating** | Silver, Ag | Silver, Ag | Silver, Ag |
| **Coating Purity** | 99.99% | 99.99% | 99.99% |
| **Deposition Technique** | Electron Beam | Electron Beam | Electron Beam |
| **Deposition Rate** | 1-2 Å/sec | 1-2 Å/sec | 1-2 Å/sec |
| **Vapor Pressure** | 10$^{-6}$ Torr | 10$^{-6}$ Torr | 10$^{-6}$ Torr |
| **Orientation** | ------- | <100> | ------- |
| **Resistivity** | ------- | 1-50 ohm-cm | ------- |
| **Front Surface** | ------- | Polished | ------- |
| **Back Surface** | ------- | Etched | ------- |

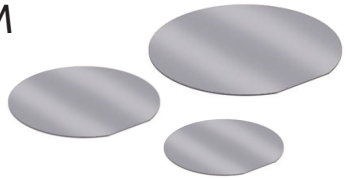
### ORDERING INFORMATION

| Cat. No. | Description | Dimensions | Qty. |
|---|---|---|---|
| **71892-30** | Silver Coated Microscope Slide | 25 x 75 x 1 (mm) | each |
| **71892-35** | Silver Coated 4" Silicon Wafer, P-Type <100> | 100 mm dia., 0.525 mm th. | each |
| **71892-40** | Silver Coated 2" Silicon Wafer, P-Type <100> | 50 mm dia., 0.279 mm th. | each |
| **71892-45** | Silver Coated Square Coverslips | 22 x 22 x 0.2 (mm) | 2/pk |
| **71892-50** | Silver Coated Round Coverslips | 16 mm dia., 0.15 mm | 2/pk |

# AFM & STM SUPPLIES

## Silicon Wafers for AFM, STM

### Ultra-Flat Silicon Wafers



These ultra-flat wafers can be used for substrate studies or as substrate for AFM and SEM samples by cleaving the wafer.

### SPECIFICATIONS

| | 4" | 6" | 8" |
|---|---|---|---|
| **Material:** | Silicon | Silicon | Silicon |
| **Diameter**: | 100 mm | 150 mm | 200 mm |
| **Orientation**: | <100> | <100> | <100> |
| **Type/Dopant**: | P/Boron | P/Boron | P/Boron |
| **Grade**: | Prime/CZ Virgin | Prime/CZ Virgin | Prime/CZ Virgin |
| **Growth Method**: | CZ | CZ | CZ |
| **Resistivity**: | 10-20 Ohm-cm | 10-20 Ohm-cm | 10-20 Ohm-cm |
| **Thickness**: | 525µm ±20µm | 675µm ±20µm | 725µm ±20µm |
| **TTV**: | <4.00µm | <4.00µm | <4.00µm |
| **SFPD**: | <2.0µm | <2.0µm | <2.0µm |
| **Warp**: | ≤30µm | ≤30µm | ≤30µm |
| **Bow**: | ≤30µm | ≤30µm | ≤30µm |
| **Particles**: | ≤20@≥0.3µm | ≤20@≥0.3µm | ≤20@≥0.3µm |
| **Front Surface**: | Polished | Polished | Polished |
| **Back Surface**: | Etched | Etched | Etched |
| **Flat**: | 2 per SEMI Standard | 1 per SEMI Standard | 2 per SEMI Standard |
| **Site Flatness**: | <2.0µm | <2.0µm | <2.0µm |
| **Roughness**: | Typically 2-3Å | Typically 2-3Å | Typically 2-3Å |

### ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **71893-01** | Ultra-Flat Silicon Wafer, 4" | each |
| **71893-02** | Ultra-Flat Silicon Wafer, 6" | each |
| **71893-03** | Ultra-Flat Silicon Wafer, 8" | each |

### Silicon Wafers Type P

These silicon wafers can be used for substrate studies or as substrate for AFM and SEM samples by cleaving the wafer.

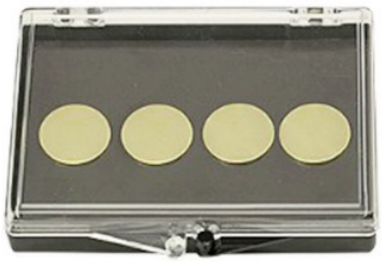
### SPECIFICATIONS

| | 1" | 2" | 3" | 4" | 6" |
|---|---|---|---|---|---|
| **Material** | Silicon | Silicon | Silicon | Silicon | Silicon |
| **Diameter** | 25 mm | 50 mm | 76 mm | 100 mm | 150 mm |
| **Orientation** | <100> | <100> | <111> | <100> | <100> |
| **Resistance** | 1-30 Ohms | 1-30 Ohms | 1-30 Ohms | 1-30 Ohms | 1-30 Ohms |
| **Type P** | Boron - 1 primary flat | Boron - 1 primary flat | Boron - 1 primary flat | Boron - 1 primary flat | Boron - 1 primary flat |
| **$SiO_2$ top coating** | None | None | None | None | None |
| **Wafer Thickness** | 10-12 mill (254-304µm) | 9-13 mill (230-330µm) | 13.6-18.5 mill (345-470µm) | 18.7-22.6 mill (475-575µm) | 23.6-25.2 mill (600-690µm) |
| **Roughness** | 2nm | 2nm | 2nm | 2nm | 2nm |
| **TTV** | <20µm | | | | |
| **Polished** | on one side | on one side | on one side | on one side | on one side |

### ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **71893-04** | Silicon Wafer Type P, 1" | each |
| **71893-05** | Silicon Wafer Type P, 2" | each |
| **71893-06** | Silicon Wafer Type P, 3" | each |
| **71893-07** | Silicon Wafer Type P, 4" | each |
| **71893-08** | Silicon Wafer Type P, 6" | each |

## Gold Coated Specimen Discs



These metal specimen discs are high quality – made of magnetic stainless steel coated with 1µm gold. They have smooth edges and consistently flat surfaces to ensure secure holding. Specimens can be mounted directly on the metal discs with double sided tape, epoxy or conductive paste. If a mica specimen support is needed, the mica discs can be easily mounted on the metal support discs.

These discs offer excellent resistance to electromigration, high electrical and thermal conductivity, and high temperatures making them excellent substrates for mounting specimens.

Packaged in a polystyrene disc storage box.

| Cat. No. | Description | Qty. |
|---|---|---|
| **75011-10** | 10mm Gold Coated Specimen Discs for AFM | 4/pk |
| **75011-12** | 12mm Gold Coated Specimen Discs for AFM | 4/pk |
| **75011-15** | 15mm Gold Coated Specimen Discs for AFM | 4/pk |
| **75011-20** | 20mm Gold Coated Specimen Discs for AFM | 4/pk |

## Metal Specimen Discs

for use with the Atomic Force Microscope

These are high quality metal discs with smooth edges and flat surfaces for use in Atomic force Microscopy.

| Cat. No. | Description | Qty. |
|---|---|---|
| **75010-10** | 10mm Metal Specimen Discs for AFM | 50/pk |
| **75010-12** | 12mm Metal Specimen Discs for AFM | 50/pk |
| **75010-15** | 15mm Metal Specimen Discs for AFM | 50/pk |
| **75010-20** | 20mm Metal Specimen Discs for AFM | 50/pk |



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Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

# AFM & STM SUPPLIES

## Pick-up Tool for AFM

Retrieve your discs from their carrier with this magnetic pick-up tool. Made with a plastic handle, a stainless steel shaft and a magnetic pad at the tip. Your fingers never need to touch the disc..

| Cat. No. | Description | Qty. |
|---|---|---|
| **75013** | Magnetic Pick-up Tool for AFM | each |

## Disc Gripper for AFM

Use these unique grippers to easily pick up AFM/STM discs from a flat surface. Features a protective rubber-coated tip. Available in 4 sizes.

| Cat. No. | Description | Qty. |
|---|---|---|
| **75009-10** | 10 mm Disc Gripper for AFM | each |
| **75009-12** | 12 mm Disc Gripper for AFM | each |
| **75009-15** | 15 mm Disc Gripper for AFM | each |
| **75009-20** | 20 mm Disc Gripper for AFM | each |

## Magnetic Disc Storage Boxes for AFM

Store AFM/STM discs in a dust-free environment*

These storage boxes have a magnet base to hold the magnetic stainless steel AFM discs and magnetic AFM sample holders. They are made of polystyrene with hinged lids. Perfect for storaging, archiving and transporting AFM discs.


### SPECIFICATIONS

| Cat. No. | Number of Discs | Inside Dimensions | Color |
|---|---|---|---|
| **75012-01** | Holds 1-4 AFM Discs | 32 x 32 x 25mm | Clear |
| **75012-02** | Holds 4-8 AFM Discs | 72 x 30 x 19mm | Clear |
| **75012-03** | Holds 6-12 AFM Discs | 72 x 51 x 12.5mm | Clear/Black |

**Note: Carrier only - Discs not included***

### ORDERING INFORMATION

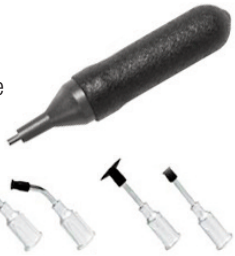
| Cat. No. | Description | Qty. |
|---|---|---|
| **75012-01** | Small Magnetic Disc Storage Box for AFM | each |
| **75012-02** | Medium Magnetic Disc Storage Box for AFM | each |
| **75012-03** | Large Magnetic Disc Storage Box for AFM | each |

## Handi-Vac® Vacuum Cup


The Handi-Vac®-2 has an improved tip designed for better lifting capacity utilizing larger, non-marking vacuum cups. This new tip also enhances functionality and improves accuracy when picking and placing parts. It can be purchased with one static-dissipative cup available in three sizes: T", ½" and T". The entire vacuum tool is ESD-safe.

| Cat. No. | Description | Qty. |
|---|---|---|
| **71921-01** | Handi-Vac-2, ⅜" (9.53mm) Vacuum Cup | each |
| **71921-02** | Handi-Vac-2 With ½" (12.7mm) Vacuum Cup | each |
| **71921-03** | Handi-Vac-2 With ⅝" (15.88mm) Vacuum Cup | each |

## Handi-Vac® Squeeze Bulb



The Handi-Vac® Squeeze Bulb Kit is a versatile, cost-effective vacuum tool system that should be on every tool-bench.

### FEATURES:

- **(1) 1/8" vacuum cup on bent probe**
- **(1) 1/4" vacuum cup on bent probe**
- **(1) 1/8" vacuum cup on straight probe**
- **(1) 3/8" vacuum cup on straight probe**

### APPLICATIONS

**SMT parts • Metal parts • Plastic parts • Smooth, nonporous-surfaces**

This tool can be used with larger rubber vacuum cups ranging in size from 3/32" (2.38mm) to 3/4" (19.05mm) in diameter. Use the larger cups to pick up larger and heavier parts by placing them directly on the Handi-Vac tip without using a probe.

| Cat. No. | Description | Qty. |
|---|---|---|
| **71921-25** | Handi-Vac® Squeeze Bulb Kit, includes:<br>(1) 1/8" vacuum cup on bent probe<br>(1) 1/4" vacuum cup on bent probe<br>(1) 1/8" vacuum cup on straight probe<br>(1) 3/8" vacuum cup on straight probe | each |

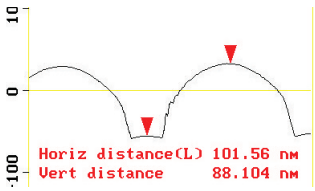
## Vacuum Pick-Up Squeeze Bulb

This portable vacuum anti-static pick-up device is ideal for objects ranging in size from 0.200 to 3.00 square inches. Ground strap recommended to ensure static discharge.

| Cat. No. | Description | Qty. |
|---|---|---|
| **71922** | Vacuum Pick-Up Squeeze Bulb | each |

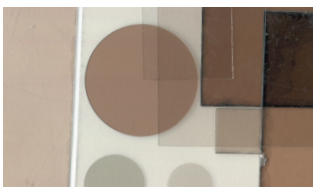
# RELATED PRODUCTS...

**Disc (Tab) Punch**
**See page 131.**




**Calibration for AFM**
**See pages 96-102.**

**SampleSaver™ Portable Storage Containers**
**See page 56.**



**Mica Sheets and Disks**
**See page 54–55.**

# AFM & STM SUPPLIES

## Vacuum Pick Up System

Handle delicate miniature objects without scratching, breaking or pinching. The system avoids contamination of parts and performs functions that tweezers does such as sorting, picking up, holding, carrying, and transferring. As well it is an alter-native way for handling cover slips without the use of forceps.

- **Picks up grids faster and easier than tweezers – WARNING: Never use this device on coated grids**
- **Quiet operation**
- **Eliminates all tweezer damage to grids**
- **Good suction (produces 14" Hg vacuum and an air flow of 125 cubic inches/minute); Can pick up aluminum stubs**
- **Can be used as a tool to pick up glass slides, cover slips, wafers, thin film samples, etc.**

Double-insulated (115-120V, 60Hz, 2-wire). Light weight, completely assembled and ready for immediate operation as soon as the proper tip is selected and installed. Vacuum is created at the tip by placing the finger over the control hole on the anodized aluminum vacuum pen. To break the vacuum, just remove your finger from the hole.

**Vacuum Pick-up System includes:** Vacuum Pick-up System complete set: Vacuum Generator, Aluminum Vacuum Pen, Five Vacuum Tips, Set of seven Rubber Vacuum Cups (size ranging: 9/16", ½", 7/16", ⅜", 5/16", ¼" and 3/16"), an In-Line Filter, and 4 ft (122 cm) of Vacuum Tubing.

| Cat. No. | Description | Qty. |
|---|---|---|
| **71894** | Vacuum Pick-Up System, 115V/60Hz | each |
| **71895** | Vacuum Pick-Up System, 220/60Hz | each |
| **71896** | Vacuum Generator 115V | each |
| **71897** | Vacuum Generator 220V | each |
| **71894-01** | Vacuum Pick-up Pen only | each |
| **71904-02** | Vacuum in-line-filter ⅜" x 1½" | each |
| **Vacuum pick-up tips, Stainless steel, 1.5" long:** | | |
| **71898** | 12 gauge, 0.109" (O.D.); 0.085" (I.D.) | each |
| **71899** | 16 gauge, 0.065" (O.D.); 0.047" (I.D.) | each |
| **71900** | 18 gauge, 0.050" (O.D.), 0.033" (I.D.) | each |

| Cat. No. | Description | Qty. |
|---|---|---|
| **71901** | 20 gauge, 0.035" (O.D.), 0.022" (I.D.) | each |
| **71902** | 25 gauge, 0.020" (O.D.), 0.095" (I.D.) | each |
| **71903** | Vacuum suction cups 0.500" diameter | each |
| **71904** | Vacuum suction cups 0.250" diameter | each |
| **71905** | Vacuum suction cups 0.164" diameter | each |
| **71906** | 5⁄16" (7.94mm) Vacuum Suction Cup | each |
| **71907** | ¼" (7.94mm) Vacuum Suction Cup | each |
| **71909** | Set of 7 Rubber Cups (9/16", ½", 7/16", ⅜", 5/16", ¼", and 3/16") | 7/set |

## Pen Vac™

Pen-Vac™ is a new improved way to handle small, flat surface objects. Pen-Vac is ideal for EM work. It can be used to handle grids, pick up stubs, align membranes, work with glass slides, cover slips and much more. Holds up to one minute.

- **Lifts up to 50 grams.**
- **Totally self-contained vacuum.**
- **Light-weight, less than 1oz.**
- **Fits in your pocket like a pen.**
- **Brushed aluminum body.**
- **Optional storage compartment for vacuum tips and cups.**
- **No power supply needed.**
- **Available in various sizes.**
- **Interchangeable vacuum probes.**



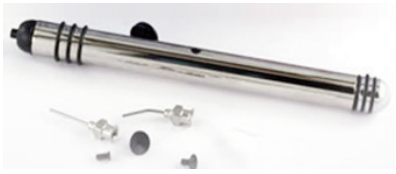
### Pen-Vac™ comes with:

- **A variety of vacuum probes, with an attached vacuum cup and it is available with plastic or aluminum hubs. Straight and angled to suit your applications. The stainless steel needle portion of the probes are one-half inch long.**
- **We offer the Static Dissipative and Conductive Cups that provide ESD protection for electrostatic discharge of sensitive components. Cups comes in three sizes: ⅛" (3.17mm); ¼" (6.35mm); and ⅜" (9.52mm).**

**Set consists of:** One Pen with 6 Probes and Cups. (6 Probes: 3 angled, ⅛", ¼", ⅜" and 3 straight ⅛", ¼", ⅜")

| | | |
|---|---|---|
| **71914** | Complete Pen-Vac System | set |
| **71915** | Same as 71914 with Deluxe Case | set |
| **Probes and Cups:** | | |
| **71916** | ⅛" Straight and Bent, Small | 2/pk |
| **71917** | ¼" Straight and Bent, Medium | 2/pk |
| **71918** | ⅜" Straight and Bent, Large | 2/pk |

## ESD Vacuum Tool



Battery-free, hand-held vacuum pick up pen designed for the safe pick-up of SMD components during assembly, test and rework processes. With fountain-pen dimensions, Vampire grabs, lifts and places components in complete safety, aided by a powerful internal piston and a full ESD protection. A complete choice of tips designed for any size of SMD component helps the operator to have always the right tool in hand. Includes: pen, conductive metal straight needle, 45° angled metal needle, conductive rubber cup 4mm, conductive rubber cup 6mm, conductive rubber cup 9 mm, and lubricant kit.

| Cat. No. | Description | Qty. |
|---|---|---|
| **71927-01** | ESD Vacuum Tool Kit, **includes:** vacuum pen, straight conductive metal needle, 45°angled conductive metal needle, conductive rubber cup 4mm, conductive rubber cup 6mm, conductive rubber cup 9mm | kit |
| **71927-02** | ESD Vacuum tool replacement set: **includes:** straight conductive metal needle, 45°angled conductive metal needle, conductive rubber cup 4mm, conductive rubber cup 6mm, conductive rubber cup 9mm | set |
| **71927-03** | ESD Vacuum tool replacement set: **includes:** conductive rubber cup 4mm, conductive rubber cup 6mm, conductive rubber cup 9mm | set |
| **71927-04** | Spare ESD 4mm cups | each |
| **71927-05** | Spare ESD 6mm cups | each |
| **71927-06** | Spare ESD 9mm cups | each |
| **71927-07** | Straight needle with ESD 4mm cup | each |
| **71927-08** | Straight needle with ESD 6mm cup | each |
| **71927-09** | Straight needle with ESD 9mm cup | each |
| **71927-10** | 45° angle needle with ESD 4mm cup | each |
| **71927-11** | 45° angle needle with ESD 6mm cup | each |
| **71927-12** | 45° angle needle with ESD 9mm cup | each |



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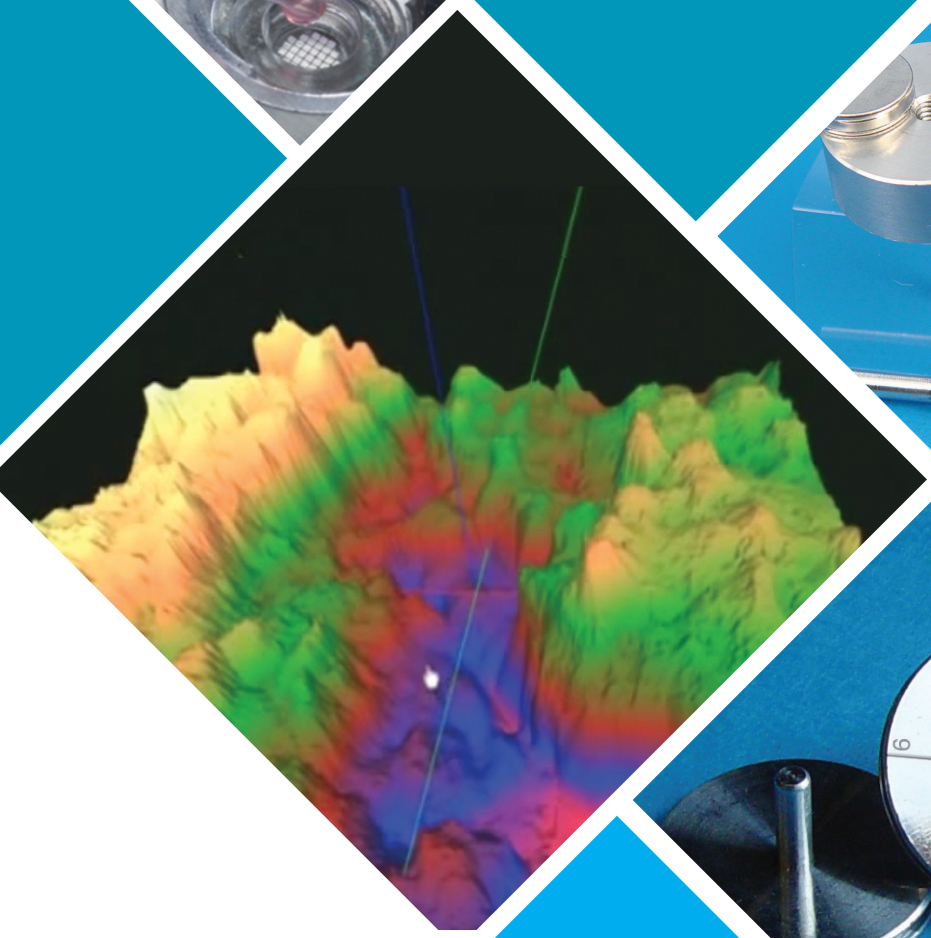
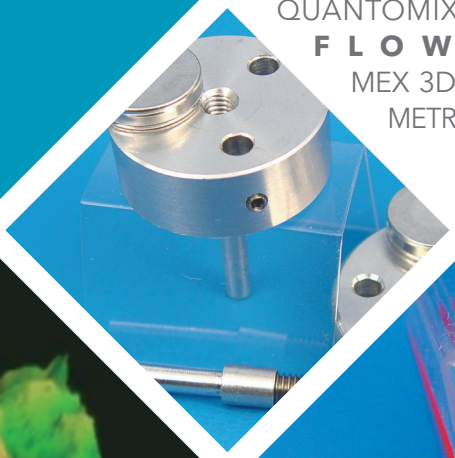
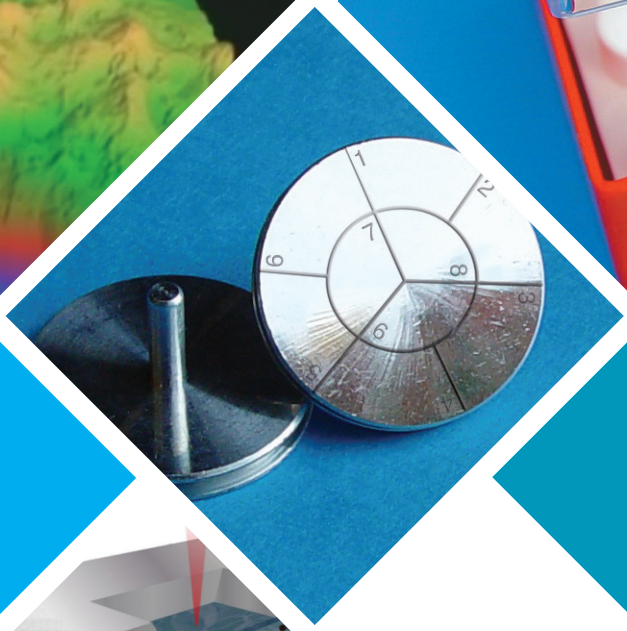
Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

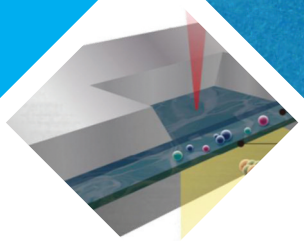
# SEM SUPPLIES

**SPECIMEN MOUNTS,** SPECIMEN HOLDERS, **PLANCHETS,** FORENSICS SUPPLIES, **MICA SHEETS & DISCS,** FINDER GRIDS, **SPECIMEN PREPARATION STANDS,** SEM STORAGE CONTAINERS & RACKS, **COLLOIDAL COMPOUNDS, CONDUCTIVE ADHESIVES, TABS & TAPE,** QUANTOMIX WET SEM, **FLOWVIEW,** MEX 3D SURFACE METROLOGY







Electron Microscopy Sciences

www.emsdiasum.com

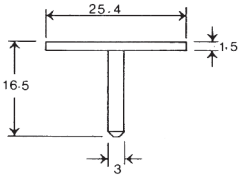
# SEM SUPPLIES

## Specimen Mounts...*Expanding our selection...*

We have now expanded our Specimen Mount section due to the increased demand for us to offer more of a variety.
To make your SEM work easier and save you a great deal of time searching for the right mount, we now offer you a complete line of specimen mounts.
**Aluminum Mounts -** Made from ultra-pure aluminum.
The more popular mounts are available in two grades of finish: *standard and polished (luster).*
***Standard Finish:*** lathe finish; economically priced.
***Polished Finish:*** A cloth polished finish which produces a smooth and luster surface.
**Carbon Mounts -** Spectroscopically pure.

### AMRAY 1000/1200

Head: 1" dia. (25.4mm),
pin ⅛" dia. (3.1mm)



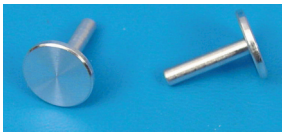

75100

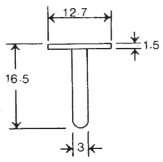
**Aluminum:** Standard

| | |
|---|---|
| **75100** | 10/pk |
| **75110** | 50/pk |
| **75120** | 100/pk |

### AMRAY 1000/1200/1400

Head: ½" dia. (12.7mm),
pin ⅛" dia. (3.1mm)






75140

**Aluminum:** Standard

| | |
|---|---|
| **75140** | 10/pk |
| **75150** | 50/pk |
| **75160** | 100/pk |

**Polished**

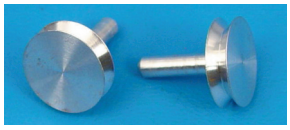
| | |
|---|---|
| **75165** | 10/pk |
| **75166** | 50/pk |
| **75167** | 100/pk |

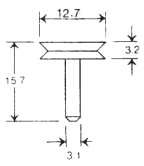
**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76140** | 10/pk |
| **76150** | 50/pk |
| **76160** | 100/pk |

### AMRAY 1400

Slotted Head ½" dia. (12.7mm),
pin ⅛" dia. (3.1mm)






75170

**Aluminum:** Standard

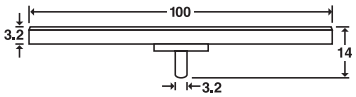
| | |
|---|---|
| **75170** | 10/pk |
| **75172** | 50/pk |
| **75174** | 100/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76170** | 10/pk |
| **76171** | 50/pk |

### AMRAY, Cambridge, Leica, ZEISS/LEO, FEI/Philips, CamScan, Tescan

Head: 100 mm,
pin ⅛" dia. (3.2mm)



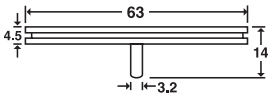

75239-10

**Aluminum:** Standard

| | |
|---|---|
| **75239-10** | each |
| **75239-20** | 5/pk |
| **75239-30** | 10/pk |

### AMRAY, Cambridge, Leica, ZEISS/LEO, FEI/Philips, CamScan, Tescan, Slotted Head

Head: 2.48" dia. (63 mm),
Pin ⅛" dia. (3.2mm), Pin Length: 9.5mm



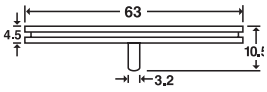

75636-70

**Aluminum:** Standard

| | |
|---|---|
| **75636-70** | 10/pk |
| **75636-80** | 50/pk |
| **75636-90** | 100/pk |

Shorter pin for all Zeiss/LEO SEM, FESEM & FIB systems, Slotted Head

Head: 2.48" dia. (63 mm),
Pin ⅛" dia. (3.2mm), Pin Length: 6mm



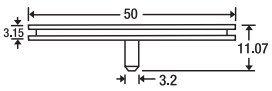

75639-10

**Aluminum:** Standard

| | |
|---|---|
| **75639-10** | each |
| **75639-20** | 5/pk |
| **75639-30** | 10/pk |

### AMRAY, Cambridge, Leica, ZEISS/LEO, FEI/Philips, CamScan, Tescan, Slotted Head

Head: 2" dia. (50 mm),
pin ⅛" dia. (3.2mm), Pin Length: 8mm



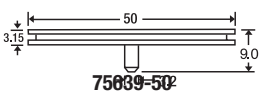

75636-40

**Aluminum:** Standard

| | |
|---|---|
| **75636-40** | 10/pk |
| **75636-50** | 50/pk |
| **75636-60** | 100/pk |

Shorter pin for all Zeiss/LEO SEM, FESEM & FIB systems, Slotted Head

Head: 2" dia. (50 mm),
pin ⅛" dia. (3.2mm), Pin Length: 6mm




75639-50

**Aluminum:** Standard

| | |
|---|---|
| **75639-50** | each |
| **75639-60** | 5/pk |
| **75639-70** | 10/pk |



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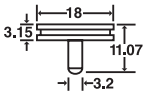
## Specimen Mounts (continued)

### Cambridge, Leica, ZEISS/LEO, FEI/Philips, PHENOM, CamScan, Tescan Slotted Head

Head: 18 mm, pin ⅛" dia. (3.2mm)
Pin Height: 8mm




75636-10

**Aluminum:** Standard

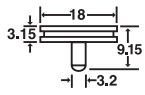
| | |
|---|---|
| **75636-10** | 10/pk |
| **75636-20** | 50/pk |
| **75636-30** | 100/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **75636-02** | 10/pk |
| **75636-03** | 50/pk |

Shorter pin for all Zeiss/LEO SEM, FESEM & FIB systems, Slotted Head

Head: 18 mm, pin ⅛" dia. (3.2mm)
Pin Height: 6mm



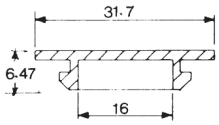

75636-04

**Aluminum:** Standard

| | |
|---|---|
| **75636-04** | 10/pk |
| **75636-05** | 50/pk |
| **75636-06** | 100/pk |

### Cambridge S-4, Mark II, S-410...

Head: 1¼" dia. (31.7mm)
x 3/16" H (6.4mm)




75050

**Aluminum:** Standard

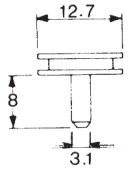
| | |
|---|---|
| **75050** | 10/pk |
| **75060** | 50/pk |
| **75070** | 100/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76180** | 10/pk |
| **76181** | 50/pk |

### Cambridge, Phillips, Camscan, PHENOM, B&L, Etec, Zeiss, etc.

Tapered end pin, Slotted head ½" dia. (12.7mm), pin ⅛" dia. (3.1mm)




75200

**Aluminum:** Standard

| | |
|---|---|
| **75200** | 10/pk |
| **75210** | 50/pk |
| **75220** | 100/pk |
| **75230** | 500/pk |

**Polished**

| | |
|---|---|
| **75235** | 10/pk |
| **75236** | 50/pk |
| **75237** | 100/pk |
| **75238** | 500/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76200** | 10/pk |
| **76210** | 50/pk |
| **76220** | 100/pk |

### Cambridge, Leica, LEO, ZEISS, Philips, FEI, CamScan, Tescan, ETEC

Slotted Head, numbered 1-alpha/4-numeric.*
Head: ½" (12.7mm), pin ⅛" dia. (3.2mm), Pin Height: 8mm


75220-12

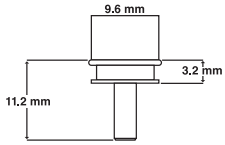
**Aluminum:** Standard

| | |
|---|---|
| **75220-12** | 500/pk |

* Designate number sequence when ordering

### Cambridge, Leo, Phillips 500, Cameca etc.

Aluminum small, slotted head
Head: ⅜" (9.6 mm) x 7/16" (11.2 mm) H,
Pin: ⅛" (3.1mm)

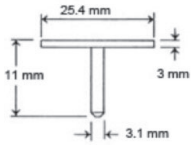



75180

| | |
|---|---|
| **75180** | 100/pk |
| **75181** | 500/pk |

### Cambridge, Leo, Philips 500, Cameca etc.

Aluminum, non-slotted head.
Head 1" (25.4 mm),
pin 3.1 mm x 11mm long total
(or 8 mm pin only)

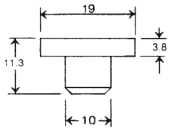



75186

| | |
|---|---|
| **75186** | 100/pk |

### Coates & Welter

Head: ¾" dia. (19mm)
Pin: ⅜" dia. (9.6mm)




75250

**Aluminum:** Standard

| | |
|---|---|
| **75250** | 10/pk |
| **75252** | 50/pk |
| **75254** | 100/pk |

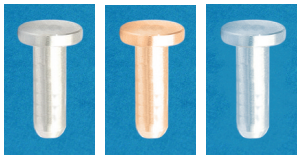
## Mini Pin Stubs

These mini pin stubs, made from either aluminum, copper, or stainless steel, come on a 3.2mm pin and are available in two lengths.

Aluminum is used for standard applications. Copper is for cryo or heat stage applications. Stainless steel is for non-corrosive applications.

### Mini Pin — For FEI, Tescan, Zeiss, Leo, Philips, Cambridge, AMRAY, Leica, CamScan, ETEC

**Head:** 6.6 x 1.3mm, **Pin:** 9.5mm

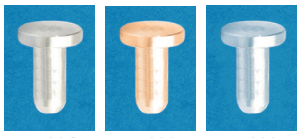


75638 75825 75827

| | | |
|---|---|---|
| **75638-10** | Aluminum | 10/pk |
| **75638-20** | Aluminum | 50/pk |
| **75638-30** | Aluminum | 100/pk |
| **75825** | Copper | 100/pk. |
| **75827** | Stainless Steel | 100/pk. |

### Mini Pin — For ZEISS/LEO

**Head:** 6.6 x 1.3mm **Pin:** 6.25mm



75824 75826 75828

| | | |
|---|---|---|
| **75824** | Aluminum | 100/pk |
| **75826** | Copper | 100/pk |
| **75828** | Stainless Steel | 100/pk. |

# SEM SUPPLIES

## Specimen Mounts (continued)

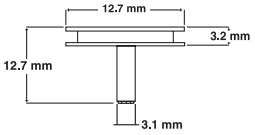
### FEI, Phillips, LEO, Zeiss, Cambridge, Leica, Amray, Tescan and Camscan SEMs

*3-Divisions*

Head: ½" dia. (12.7 mm)
Pin Height: 9.0 mm
Pin: ⅛" (3.2mm)

**Aluminum:** Standard

| | |
|---|---|
| **75183-10** | 10/pk |
| **75183-20** | 50/pk |
| **75183-30** | 100/pk |




**75183-10**

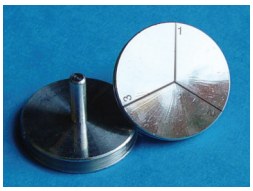
### FEI, Phillips, LEO, Zeiss, Cambridge, Leica, Amray, Tescan and Camscan SEMs

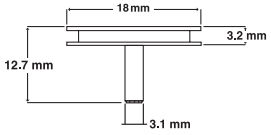
*3-Divisions*

Head: 18 mm
Pin Height: 9.0 mm
Pin: ⅛" (3.2mm)

**Aluminum:** Standard

| | |
|---|---|
| **75183-01** | 10/pk |
| **75183-02** | 50/pk |
| **75183-03** | 100/pk |






**75183-01**

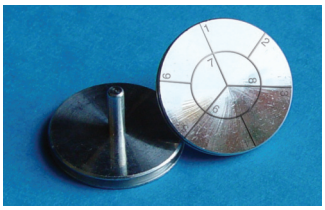
### FEI/Philips, ZEISS/LEO, Cambridge, Leica, Amray, Tescan and Camscan SEMs

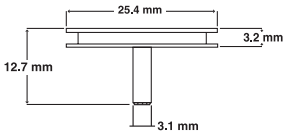
*9 Divisions*

Head: 1" dia. (25mm)
Pin Height: 9.0mm
Pin: ⅛" dia. (3.2mm)

**Aluminum:** Standard

| | |
|---|---|
| **75183-40** | 10/pk |
| **75183-50** | 50/pk |
| **75183-60** | 100/pk |






**75183-40**

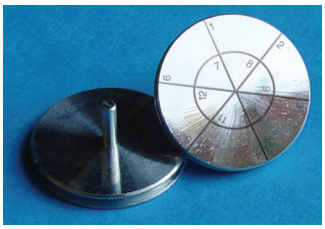
### FEI/Philips, ZEISS/LEO, Cambridge, Leica, Amray, Tescan and Camscan SEMs

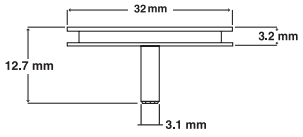
*12-Divisions*

Head: 32 mm
Pin Height: 9.0 mm
Pin: ⅛" (3.2mm)

**Aluminum:** Standard

| | |
|---|---|
| **75183-62** | 10/pk |
| **75183-63** | 50/pk |
| **75183-64** | 100/pk |






**75183-62**

# NEW

### Gatan 3View® System SEM Pin Stubs

The Gatan 3View systems use special sample pins. These are used inside SEMs to create 3D imaging data of samples by serial slicing and BSD imaging. The sample pins are offered with two sample areas:

- **Standard 1.4mm flat sample area**
- **Larger 2.4mm flat sample area**

These pins are fully compatible with the Gatan 3View systems; 2 mm pin, 3 mm head with cone top and total height of 12.5 mm. Manufactured from vacuum grade aluminum.

**75959-01**

**75959-03**

***When you need a special Gatan 3View sample stub which is not offered here or on our website, please contact us. We can manufacture custom sample stubs or might be able to suggest a solution with alternative sample stubs.***

**Aluminum:** Standard

| | | |
|---|---|---|
| **75959-01** | Gatan 3View system SEM pin stubs, standard 1.4 mm flat, 2 mm pin x 12.5 mm H | 10/pk |
| **75959-02** | Gatan 3View system SEM pin stubs, standard 1.4 mm flat, 2 mm pin x 12.5 mm H | 50/pk |
| **75959-03** | Gatan 3View system SEM pin stubs, large 2.4 mm flat, 2 mm pin x 12.5 mm H | 10/pk |
| **75959-04** | Gatan 3View system SEM pin stubs, large 2.4 mm flat, 2 mm pin x 12.5 mm H | 50/pk |

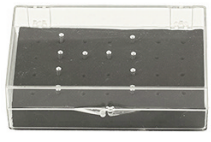
### Gatan 3View® Stub Handling Tweezers

The Gatan 3View stub handling Tweezers are especially designed for handling the 2 mm thin pin of the 3View system stubs used in the Gatan 3View system. They are designed as side grippers for easy grabbing and holding of the 2 mm pin to facilitate handling and storing the 3View stubs. Length: 118 mm.

- **Polished edges for good contact**
- **Matte anti-glare finish**
- **Side grippers**
- **Serrated handles for extra grip**
- **Low carbon anti-magnetic stainless steel**
- **Optimized for 2mm pin of the Gatan 3View stubs**
- **Swiss made**


| | | |
|---|---|---|
| **75959-07** | Gatan 3View stub handling tweezers, 118 mm, anti-magnetic stainless steel | each |

### Storage Box for Gatan 3View® Pin Stubs



Stores 28 Gatan 3View pin stubs. Made from clear polystyrene, it has two hinges and a snap-lock. Pins are held by a custom high density closed cell NBR foam which doesn't crumble and is elastic enough to allow repetitive loading and retrieving of the pins. Outside dimensions: 120 x 84 x 36 mm.

| | | |
|---|---|---|
| **75959-08** | Storage box for Gatan pin stubs | each |



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# SEM SUPPLIES

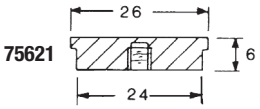
## Specimen Mounts (continued)

### Hitachi

M4 Tapered hole, female thread
Head: 1" dia. (26mm), Height: ¼" (6mm)
Comes either plain or with 9 divisions.

**Aluminum:** Standard

| | |
|---|---|
| **75621** | 10/pk |
| **75622** | 50/pk |
| **75623** | 100/pk |
| **75621-D** | 10/pk |
| **75622-D** | 50/pk |
| **75623-D** | 100/pk |




75621

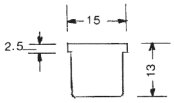
**75621-d (9 divisions)**

### Hitachi

Head: ⅝" dia. (15mm)
Height: ½" (13mm)

**Aluminum:** Standard

| | |
|---|---|
| **75630** | 10/pk |
| **75631** | 50/pk |
| **75632** | 100/pk |



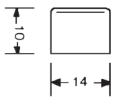

**75630**

### Hitachi

Head: ⅜" (14mm),
Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75650** | 10/pk |
| **75651** | 50/pk |
| **75652** | 100/pk |




**75650**

### Hitachi S-450

M4 Tapered hole, female thread
Head: ⅝" (15mm), Height: ¼" (6mm)

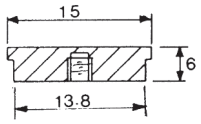
Comes plain or with 3 divisions

**Aluminum:** Standard

| | |
|---|---|
| **75600** | 10/pk |
| **75610** | 50/pk |
| **75620** | 100/pk |
| **75600-D** | 10/pk |
| **75610-D** | 50/pk |
| **75620-D** | 100/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76470** | 10/pk |
| **76471** | 50/pk |




**75600**

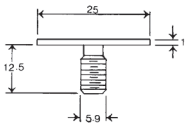
**75600-D (3 divisions)**

### Hitachi S-500

Threaded pin
Head: 1" dia. (25mm),
pin: ¼" dia. (6mm)

**Aluminum:** Standard

| | |
|---|---|
| **75640** | 10/pk |
| **75642** | 50/pk |
| **75644** | 100/pk |



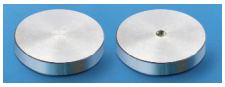

**75640**

### Hitachi, M4

Head: 1 ¼" (32mm), Height: ¼" (6mm)

**Aluminum:** Standard

| | |
|---|---|
| **75660** | 10/pk |
| **75661** | 50/pk |
| **75662** | 100/pk |



**75660**


### Hitachi M4 Thread

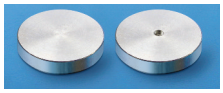
Head: 1¼" (32mm), Height: ¼" (6mm)

**Aluminum:** Standard

| | |
|---|---|
| **75635-70** | 10/pk |
| **75635-80** | 50/pk |
| **75635-90** | 100/pk |

Same as above but with 12 divisions

| | |
|---|---|
| **75635-70D** | 10/pk |
| **75635-80D** | 50/pk |
| **75635-90D** | 100/pk |




**75635-70**

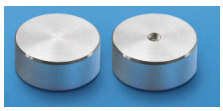
**75635-70D** (12 divisions)

### Hitachi M4 Thread

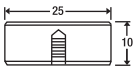
Head: 1" dia. (25mm), Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75635-40** | 10/pk |
| **75635-50** | 50/pk |
| **75635-60** | 100/pk |



**75635-40**



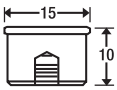

### Hitachi M4 Thread

Head: ⅝" dia. (15mm), Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75635-10** | 10/pk |
| **75635-20** | 50/pk |
| **75635-30** | 100/pk |

**75635-10**

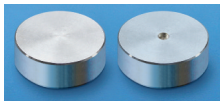



### Hitachi M4 Thread

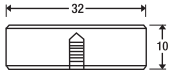
Head: 1¼" (32mm), Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75635-75** | 10/pk |
| **75635-85** | 50/pk |
| **75635-95** | 100/pk |



**75635-75**

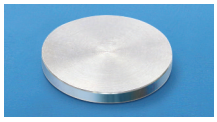


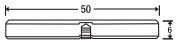

### Hitachi M4 Thread

Head: 2" (50mm), Height: ¼" (6.0mm)

**Aluminum:** Standard

| | |
|---|---|
| **75635-77** | 10/pk |
| **75635-87** | 50/pk |
| **75635-97** | 100/pk |



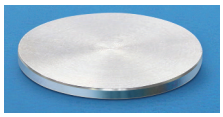


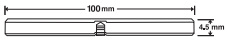

### Hitachi M4, Large

Head: 4 inch, (100mm), Height: 4.5mm

**Aluminum:** Standard

| | |
|---|---|
| **75635-78** | each |
| **75635-88** | 5/pk |

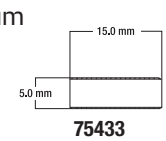





### ISI, ABT, Topcon, Aluminum

Head: ⅝" (15mm) x ¼" (5mm)

| | |
|---|---|
| **75433** | 50/pk |
| **75434** | 100/pk |

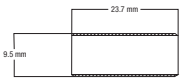



**75433**

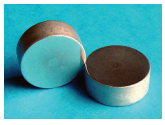
### ISI, ABT, Topcon, Aluminum

Head: 0.93" dia. (23.7mm)
Height: ⅜" (9.5mm)

| | |
|---|---|
| **75436** | 10/pk |
| **75437** | 50/pk |
| **75438** | 100/pk |




**75436**



# SEM SUPPLIES

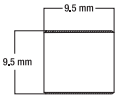
## Specimen Mounts (continued)

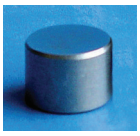
### JEOL, also ISI, ABT, Topcon

Head: ⅜" (9.5mm), Height: ⅜" (9.5mm)

**Aluminum:** Standard

| | |
|---|---|
| **75258** | 10/pk |
| **75259** | 50/pk |
| **75260** | 100/pk |
| **75261** | 500/pk |



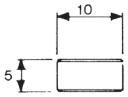
**75258**

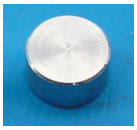
### JEOL

Head: ⅜" dia. (10mm) Height: 3/16" (5mm)

**Aluminum:** Standard

| | |
|---|---|
| **75350** | 50/pk |
| **75360** | 100/pk |
| **75370** | 500/pk |



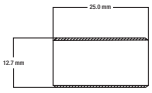



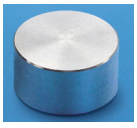
**75350**

### JEOL, Aluminum

Head: 1" dia. (25mm) Height: ½" (12.7mm)

| | |
|---|---|
| **75690** | 10/pk |
| **75691** | 50/pk |
| **75692** | 100/pk |



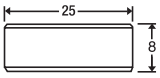
**75690**

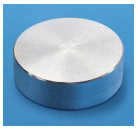
### JEOL

Head :1" dia. (25mm) Height: 8mm

**Aluminum:** Standard

| | |
|---|---|
| **75693** | 10/pk |
| **75694** | 50/pk |
| **75695** | 100/pk |



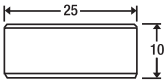
**75693**

### JEOL

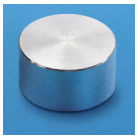
Head :1" dia. (25mm) Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75696** | 10/pk |
| **75697** | 50/pk |
| **75698** | 100/pk |




**75696**

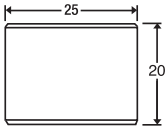


### JEOL

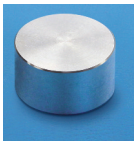
Head :1" dia. (25mm) Height: 13/16" (20mm)

**Aluminum:** Standard

| | |
|---|---|
| **75830-10** | 10/pk |
| **75830-20** | 50/pk |
| **75830-30** | 100/pk |




**75830-10**

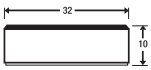


### JEOL

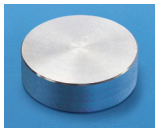
Head: 1¼" dia. (32mm)
Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75830-70** | 10/pk |
| **75830-80** | 50/pk |
| **75830-90** | 100/pk |




**75830-70**

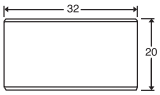


### JEOL

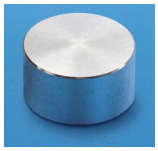
Head: 1¼" dia. (32mm)
Height: 13/16" (20mm)

**Aluminum:** Standard

| | |
|---|---|
| **75830-76** | 10/pk |
| **75830-86** | 50/pk |
| **75830-96** | 100/pk |




**75830-76**

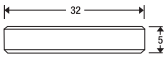


### JEOL

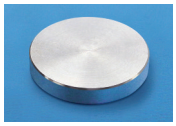
Head: 1¼" dia. (32mm)
Height: 3/16" (5mm)

**Aluminum:** Standard

| | |
|---|---|
| **75830-40** | 10/pk |
| **75830-50** | 50/pk |
| **75830-60** | 100/pk |




**75830-40**

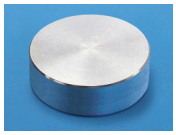


### JEOL, Aluminum

Head: 1¼" dia. (32mm)
Height: ⅜" (10mm)

| | |
|---|---|
| **75702** | 10/pk |
| **75703** | 50/pk |
| **75704** | 100/pk |


**75702**

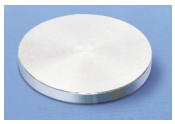


### JEOL, Aluminum

Head: 2" dia. 50mm,
Height: 3/16" (5mm)

| | |
|---|---|
| **75705** | 10/pk |
| **75706** | 100/pk |

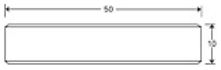

**75705**

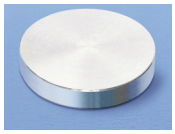


### JEOL, Aluminum

Head: 2" dia. 50mm,
Height: ⅜" (10mm)

| | |
|---|---|
| **75707** | 10/pk |
| **75708** | 100/pk |



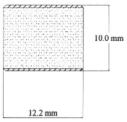



**75707**

### JEOL, Aluminum

Head: 12.2mm x 10mm H

| | |
|---|---|
| **75726** | 50/pk |
| **75727** | 100/pk |
| **75726-D** | 50/pk |
| **75727-D** | 100/pk |




**75726-D**
**(3 divisions)**

**75726**

### JEOL

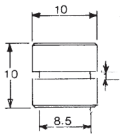
Head: ⅜" dia. (10mm), Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75300** | 10/pk |
| **75310** | 50/pk |
| **75320** | 100/pk |
| **75330** | 50/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76300** | 10/pk |
| **76310** | 50/pk |
| **76320** | 100/pk |




**75300**

### JEOL, ISI

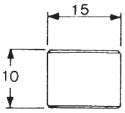
Head: ⅝" dia. (15mm), Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75440** | 10/pk |
| **75450** | 50/pk |
| **75460** | 100/pk |
| **75470** | 50/pk |

**Carbon (Spectro-pure):** Standard

| | |
|---|---|
| **76440** | 10/pk |
| **76450** | 50/pk |
| **76460** | 100/pk |



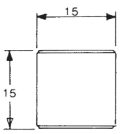

**75440**

### JEOL, ISI

Head: ⅝" dia. (15mm), Height: ⅝" (15mm)

**Aluminum:** Standard

| | |
|---|---|
| **75400** | 10/pk |
| **75410** | 50/pk |
| **75420** | 100/pk |
| **75430** | 500/pk |




**75400**



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# SEM SUPPLIES

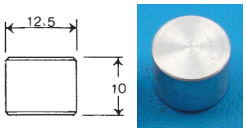
## Specimen Mounts (continued)

### JEOL JSM 840

Head: ½" dia. (12.5mm), Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75730** | 50/pk |
| **75732** | 100/pk |
| **75734** | 250/pk |



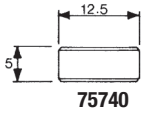

**75730**

### JEOL JSM 840

Head: ½" dia. (12.5mm)
Height: ¼" (5mm)

**Aluminum:** Standard

| | |
|---|---|
| **75740** | 50/pk |
| **75742** | 100/pk |
| **75744** | 250/pk |




**75740**

**Carbon (Spectro-pure):** Standard

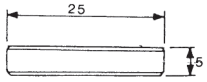
| | |
|---|---|
| **76330** | 10/pk |
| **76331** | 50/pk |

### JEOL JSM 840

Head: 1" Dia (25mm),
Height: ¼" (5mm)

**Aluminum:** Standard

| | |
|---|---|
| **75700** | 10/pk |
| **75710** | 50/pk |
| **75720** | 100/pk |



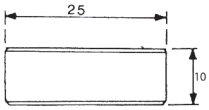

**75700**

### JEOL JSM 840

Head: 1" Dia (25mm),
Height: ⅜" (10mm)

**Aluminum:** Standard

| | |
|---|---|
| **75721** | 10/pk |
| **75722** | 50/pk |
| **75723** | 100/pk |



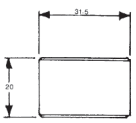

**75721**

### JEOL JSM 840

Head: 1¼" dia. (31.5mm),
Height: 13/16" (20mm)

**Aluminum:** Standard

| | |
|---|---|
| **75800** | 10/pk |
| **75810** | 50/pk |
| **75820** | 100/pk |




**75800**

### LEO Microscope

Tapered end pin. Slotted head ½" dia. (12.7mm), pin ⅛" Dia (3.1mm) x 5mm Length

| | |
|---|---|
| **75190** | 50/pk |
| **75191** | 100/pk |
| **75192** | 50/pk |

### Zeiss

Flat End Pin Head: ½" dia. (12.7mm) Slotted Head, ⅛" dia. (3.1mm) Pin

| | |
|---|---|
| **75500** | 50/pk |
| **75510** | 100/pk |
| **75520** | 500/pk |

### Leica, Cambridge, Leo, FEI, Phillips, PHENOM, Zeiss, Camscan etc.

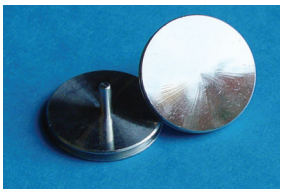
Slotted head.
Head: 38mm,
Pin: ⅛" dia. (3.1mm) x 8mm H

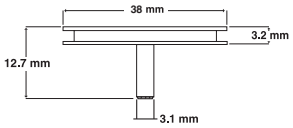
| | |
|---|---|
| **75183-65** | 10/pk |
| **75183-66** | 50/pk |
| **75183-67** | 100/pk |

Shorter pin for all Zeiss/LEO 1500 SEM, FESEM & FIB systems, Slotted Head
Head: 38mm,
Pin: ⅛" dia. (3.1mm) x 6mm H

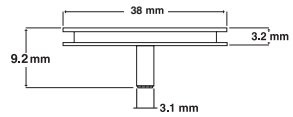
**Aluminum:** Standard

| | |
|---|---|
| **75183-68** | 10/pk |
| **75183-69** | 50/pk |
| **75183-71** | 100/pk |






**75183-65**




**75183-68**

### Leica, Cambridge, Leo, FEI, Phillips, PHENOM, Zeiss, Camscan etc.

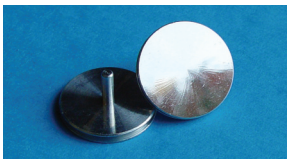
Aluminum slotted head.
Head: 1" (25.4mm),
Pin: ⅛" dia. (3.1mm) x ½" (12.7mm) H

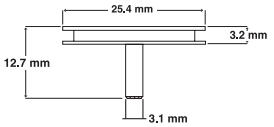
| | |
|---|---|
| **75183** | 10/pk |
| **75184** | 50/pk |
| **75185** | 100/pk |

Shorter pin for all Zeiss/LEO 1500 SEM, FESEM & FIB systems, Slotted Head
Head: 1" (25.4mm),
Pin: ⅛" dia. (3.1mm) x 6mm H

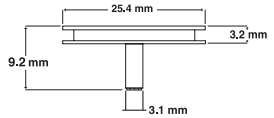
**Aluminum:** Standard

| | |
|---|---|
| **75183-72** | 10/pk |
| **75183-73** | 50/pk |
| **75183-74** | 100/pk |






**75183**




**75183-72**

### Leica, Cambridge, Leo, FEI, Phillips, Zeiss, Camscan etc.

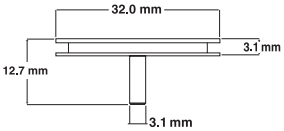
Aluminum large slotted head.
Head: 1 ¼" (32mm),
Pin: ⅛" dia. (3.1mm) x ½" (12.7mm) H

| | |
|---|---|
| **75187** | 10/pk |
| **75188** | 50/pk |
| **75189** | 100/pk |

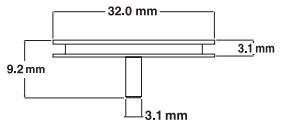
Shorter pin for all Zeiss/LEO SEM, FESEM & FIB systems, Slotted Head
Head: 1 ¼" (32mm),
Pin: ⅛" dia. (3.1mm) x 6mm H

**Aluminum:** Standard

| | |
|---|---|
| **75187-10** | 10/pk |
| **75187-20** | 50/pk |
| **75187-30** | 100/pk |




**75187**




**75187-10**

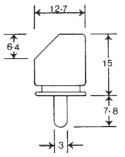
# SEM SUPPLIES

## Specimen Mounts (continued)

### 45° Angle SEM Aluminum

1) Head: ½" dia. (12.7mm), ⅛" (3.1mm) pin

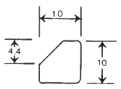
| | |
|---|---|
| **75240** | 10/pk |
| **75242** | 50/pk |


**75240**

2) Head: ⅜" dia. (10mm), Height: ⅜" (10mm)

| | |
|---|---|
| **75340** | 10/pk |
| **75342** | 50/pk |

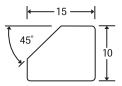




**75340**

3) Head : ⅝" dia. (15mm) Height: ⅜" (10.0mm)

**Aluminum:** Standard

| | |
|---|---|
| **75241-10** | 10/pk |
| **75241-20** | 50/pk |
| **75241-30** | 100/pk |

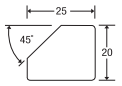




**75241-10**

4) Head :1" dia. (25mm) Height: 13/16" (20mm)

**Aluminum:** Standard

| | |
|---|---|
| **75241-40** | 10/pk |
| **75241-50** | 50/pk |
| **75241-60** | 100/pk |

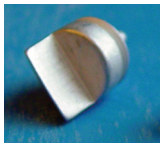



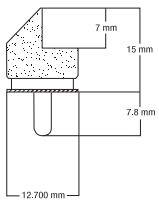

**75241-40**

### Combination 45° – 90° SEM

Aluminum slotted head with 3.1mm diameter pin, fits most SEMs

**75344** each






**75344**

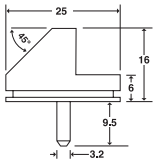
### 45°/90°

FEI, Tescan, Zeiss, Philips, Leo, Cambridge, AMRAY, Leica, CamScan, ETEC

Aluminum slotted head.

Head: 1" (25mm)
Pin Height: ⅜" (9.5m)

**75347** each


**75347**

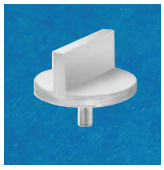
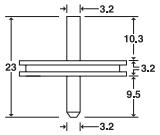
### Double 90°

FEI, Tescan, Zeiss, Philips, Leo, Cambridge, AMRAY, Leica, CamScan, ETEC

Aluminum slotted head.

Head: 1" (25mm)
Pin Height: ⅜" (9.5m)

**75348** each


**75348**

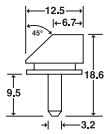
### 45° Low Profile

FEI, Tescan, Zeiss, Philips, Leo, Cambridge, AMRAY, Leica, CamScan, ETEC

Aluminum slotted head.

Head: ½" (12.7mm)
Pin Height: 3/8" (9.5mm)

**75349** each


**75349**

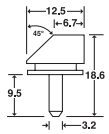
### 45° Low Profile

Shorter 6mm pin for ZEISS/LEO

Aluminum slotted head.

Head: ½" (12.7mm)
Pin Height: 1/4" (6mm)

**75351** each


**75351**

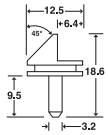
### 45° and 90° Low Profile

FEI, Tescan, Zeiss, Philips, Leo, Cambridge, AMRAY, Leica, CamScan, ETEC

Aluminum slotted head.

Head: ½" (12.7mm)
Pin Height: 3/8" (9.5mm)

**75352** each


**75352**

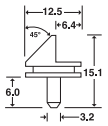
### 45° and 90° Low Profile

Shorter 6mm pin for ZEISS/LEO

Aluminum slotted head.

Head: ½" (12.7mm)
Pin Height: 1/4" (6mm)

**75353** each


**75353**

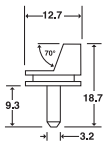
### 70° Low Profile

FEI, Tescan, Zeiss, Philips, Leo, Cambridge, AMRAY, Leica, CamScan, ETEC

Aluminum slotted head.

Head: ½" (12.7mm)
Pin Height: 3/8" (9.5mm)

**75354** each


**75354**



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# SEM SUPPLIES

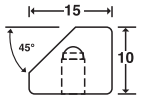
## Specimen Mounts (continued)

### 45° SEM, for Hitachi M4

Aluminum slotted head.

Head: ⅝" (15mm)
Height: ⅜" (10mm)

**75357** each



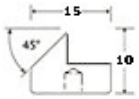

**75357**

### Combination 45° – 90° SEM, for Hitachi M4

Aluminum slotted head.

Head: ⅝" (15mm)
Height: ⅜" (10mm)

**75344-H** each



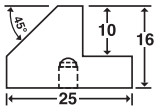

**75344-H**

### Combination 45° – 90° SEM, for Hitachi M4

Aluminum

Head: 1" (25mm)
Height: ⅝" (16mm)

**75958-25** each



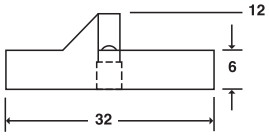

**75958-25**

### Combination 45° – 90° SEM, for Hitachi M4

Aluminum

Head: 1¼" (32mm)
Height: ½" (12mm)

**75958-26** each



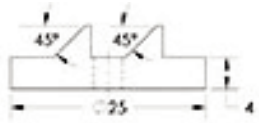

**75958-26**

### Double 45°, for Hitachi M4

Aluminum

Head: 1" (25mm)
Height: 5⁄32" inch (4mm)

**75346-H** each



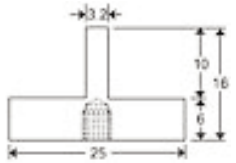

**75346-H**

### Double 90°, for Hitachi M4

Aluminum

Head: 1" (25mm)
Height: ⅝" (16mm)

**75355-H** each



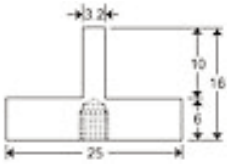

**75355-H**

### Double 90°, for Hitachi M4

Aluminum

Head: 1" (25mm)
Height: ⅝" (16mm)

| | |
|---|---|
| **75662-10** | 10/pk |
| **75662-20** | 50/pk |
| **75662-30** | 100/pk |



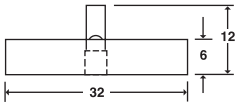

**75662-10**

### Double 90°, for Hitachi M4

Aluminum

Head: 1¼" (32mm)
Height: ½" (12mm)

**75359** each

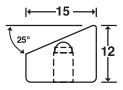



**75359**

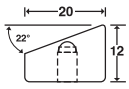
### 22°/25° for TM1000/TM3000 with EDS Analysis Systems

These angled mounts feature an orientation cross for precise positioning towards the EDS detector. A 22° or 25° tilt provides better detection and higher signal-to-noise ratio for x-ray analysis. Made from Aluminum.

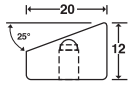
15mm dia., 25° angle, for TM-3000, M4
**75311-10** each



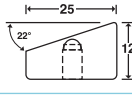

20mm dia., 22° angle, for TM-1000, M4
**75311-11** each



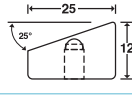

20mm dia., 25° angle, for TM-3000, M4
**75311-12** each




25mm dia., 22° angle, for TM-1000, M4
**75311-13** each

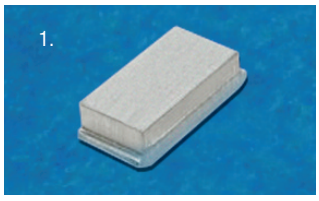


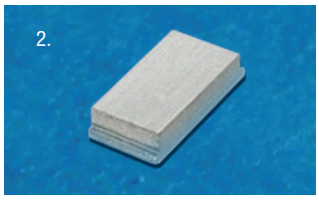

25mm dia., 25° angle, for TM-3000, M4
**75311-14** each

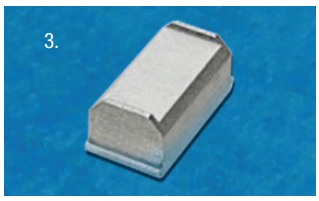


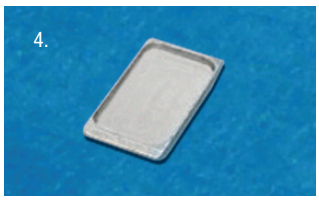

### Rectangular Specimen Mounts, Hitachi S-5200/S-5500/SU-9000

These mounts work with the Hitachi line of scopes listed above. They are made from aluminum. Available in four sizes.




**Ordering Information:**

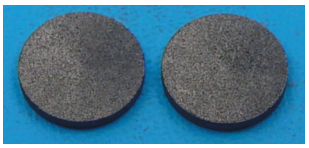
| | Cat No. | Length | Width | Height | Qty. |
|---|---|---|---|---|---|
| 1. | **75463-10** | 11mm | 5.5mm | 4mm | each |
| 2. | **75463-11** | 11mm | 5.5mm | 3.5mm | each |
| 3. | **75463-12** | 11mm | 5.5mm | 5.5mm | each |
| 4. | **75463-13** | 11mm | 5.5mm | 2mm | each |

# SEM SUPPLIES

## Carbon Planchets for SEM

1) ½" (12.7mm) surface 1/16" (1.6mm) height

| | |
|---|---|
| **76250** | 10/pk |
| **76252** | 50/pk |
| **76254** | 100/pk |



**76250**

2) 1" (25.4mm) surface 1/16" (1.6mm) height

| | |
|---|---|
| **76270** | 10/pk |
| **76272** | 50/pk |
| **76274** | 100/pk |

**76270**

## Carbon Planchet Holder

Two configurations offered: 1/2"dia. (12.7mm) and 1" dia. (25mm) with 1/8" (3.1mm) pin.

| | | |
|---|---|---|
| **76284** | Carbon Planchet Holder, ½" | each |

## Pyrolytic Graphite Planchet for SEM

Surface polish to 1 µm glassy finish

| Cat. No. | Planchet Size, Dia x Thickness, mm | Qty |
|---|---|---|
| **76290-32** | Pyrolytic Graphite Planchet, 25.4 x 3.2 | each |
| **76290-16** | Pyrolytic Graphite Planchet, 25.4 x 1.6 | each |
| **76291-32** | Pyrolytic Graphite Planchet, 13.7 x 3.2 | each |
| **76291-16** | Pyrolytic Graphite Planchet, 13.7 x 1.6 | each |

## Beryllium Planchets

These planchets are prepared from high purity beryllium (min. 98.5%) by electro-fusion to provide vacuum tight (~1x10$^{-9}$atm-cm$^3$/sec) and ±10% dimensional tolerances.

**Notes:**

1. Beryllium is a hazardous substance. Care should be taken seriously when working with this material.
2. Beryllium is a strategic commodity that is controlled by the U.S. government for reasons of nuclear non-proliferation and anti-terrorism. Its' ECCN No is 1C230. If you export this material, you must follow the Export Administration Regulations. Diversion contrary to U.S. Law is prohibited.
3. Following is the typical Specification Limits of our Be supplied by us:

| | | | Specification Limits | |
|---|---|---|---|---|
| **Characteristic** | **Unit** | **Value** | **Lower** | **Upper** |
| **Lot Identification: Lot Number** | | 5077 | | |
| **Chemistry Composition** | | | | |
| Beryllium Assay | % | 99.00 | 98.5 | — |
| Beryllium Oxide | % | 0.90 | - | 1.50 |
| Iron Content | % | 0.1000 | - | 0.1300 |
| Aluminum Content | % | 0.04 | - | 0.10 |
| Magnesium Content | % | <0.0100 | - | 0.0800 |
| Silicon Content | % | 0.0300 | - | 0.0600 |
| Carbon Content | % | 0.13 | - | 0.15 |
| Other Metallic – each | % | <0.0400 | - | 0.0400 |

| Cat. No. | Planchet Size | Qty |
|---|---|---|
| **76010** | Be Substrate Planchet 1cm Dia x 0.25mm Thick | each |
| **76014** | Be Substrate Planchet 1.27cm Dia x 0.25mm Thick | each |
| **76015** | Be Substrate Planchet 2.5cm Dia x 1.0mm Thick | each |
| **76016** | Be Substrate Planchet 50.8cm Dia x 1.0mm Thick | each |
| **76017** | Be Substrate Planchet 101.6cm Dia x 1.0mm Thick | each |

## PYROID® Pyrolytic Graphite Product Line — Vitreous Carbon Substrate

Our PYROID® pyrolytic graphite is a very light weight, 5'9's pure, solid crystal composition, with no granular components, extremely smooth surface, capable of withstanding cryogenic temperatures as well as temperatures in excess of 3000°C

The material is extremely anisotropic, meaning it conducts heat and electricity in the a-b plane like cooper but acts like a ceramic in the normal direction. In an annealed state, the thermal and conduction properties increase up to four to eight times that of aluminum and cooper respectively.

The material has zero porosity making it extremely stable and exhibits no outgassing. It is ideal for use in corrosive environments including acids and chlorine, and is highly transparent to organic samples and electrons, for analytical work, such as x-ray investigation, metallurgical, crystal growth, medical imaging technology etc.

Pyroid® is trade mark name of MINTEQ

### Physical Properties of PYROID® Pyrolytic Graphite

| Property | Direction* | Metric Units | English Units |
|---|---|---|---|
| **Density** | ----- | 2.22 g/cc | 1.37 lb/ft$^3$ |
| **Flexual Strength** | | | |
| Room Temperature | a | 840 kg/cm$^2$ | 12,000 psi |
| 2750°C | a | 3,500 kg/cm$^2$ | 50,000 psi |
| **Compressive Strength** | | | |
| Room Temperature | a | 1,050 kg/cm$^2$ | 15,00 psi |
| | c | 1,750 kg/cm$^2$ | 25,000 psi |
| **Shear Strength** | | | |
| Room Temperature | a | 70 kg/cm$^2$ | 1, 000psi |
| **Coefficient Thermal Expansion** | | | |
| Room Temperature | a | .60 x 10$^{-6}$ cm/cm°C | 1.0 x 10$^{-6}$ in/in°F |
| 2200°C | a | .68 x 10$^{-6}$ cm/cm°C | 1.2 x 10$^{-6}$ in/in°F |
| Room Temperature | c | 6.8 x 10$^{-6}$ cm/cm°C | 12.0 x 10$^{-6}$ in/in°F |
| 2200°C | c | 8.0 x 10$^{-6}$ cm/cm°C | 14.7 x 10$^{-6}$ in/in°F |
| **Thermal Conductivity** | | | |
| Room Temperature | a | 345 W/m°K | 200 BTU/(hr ft$^2$)(°F/ft) |
| 1650°C | a | 114 W/m°K | 66 BTU/(hr ft$^2$)(°F/ft) |
| Room Temperature | c | 1.73 W/m°K | 1.00 BTU/(hr ft$^2$)(°F/ft) |
| 3000°F | c | 1.30 W/m°K | 0.75 BTU/(hr ft$^2$)(°F/ft) |
| **Electric Resistivity** | | | |
| Room Temperature | a | 500 µΩcm | |
| 1650°C | a | 200 µΩcm | |
| Room Temperature | c | 0.6 Ωcm | |
| 1650°C | c | 0.22 Ωcm | |
| **Scleroscope Hardness** | a | 103 | 103 |
| | c | 68 | 68 |
| **Oxidation Threshold** | | 650°C | 1200°F |
| Permeability | | Helium Leak Tight at 10$^{-6}$ mmHg | |



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Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

## P47 Scintillators

They are coated with a thin layer of well selected P47 phosphor (Y1Si2O7:Ce3+; yttrium silicate activated with cerium), and have a high signal output and a good working life. They need not be coated with aluminum prior to use unless cathodoluminescence studies are required.

## YAG Single Crystal Scintillator Discs

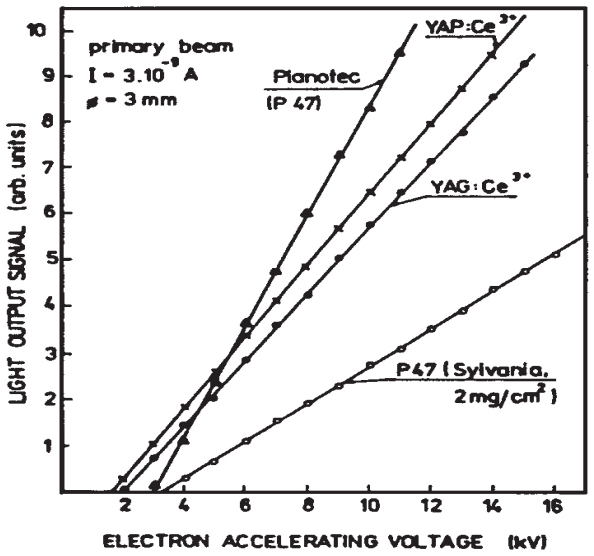
### Advantages:

- Low Phosphor Noise.
- High Resistance to Radiation Damage.
- Long Working Life.
- Possible Application in Ultrahigh Vacuum Conditions.

YAG (Yttrium Aluminum Garnet activated by $Ce^{3+}$) has a very fast response time of 50-60ns and they do withstand well to the bombardment by electrons or ions far better than plastic or phosphor scintillators. Light emission peaks at about 560nm which means that S20 photocathodes are most suitable for detecting the emission. YAG is suited for high current operations. The response is better then for the P47 discs below 5kV and again at higher accelerating voltages, where the performance of powder scintillators fall off while the response of the YAG continues to increase linearly. The crystal should be coated with 50nm of aluminum prior to use. If the layer becomes damaged it can be removed with sodium hydroxide. The crystals are mounted with the matt surface in contact with the light pipe as this has shown to increase the efficiency.

## YAP Single Crystal Scintillator Discs

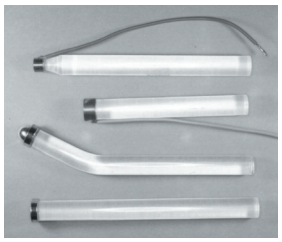
YAP (Yttrium Aluminum Perovskite activated by $Ce^{3+}$) shares the same advantages as YAG but is more efficient in terms of light output than YAG crystals. As well, the emission spectrum peaks at about 378nm, and this corresponds closely to the maximum sensitivity of the S11 photocathode which in general is used in most scanning electron microscopes. (There would be more improvement in signal by using a YAP crystal rather than YAG in these microscopes). The decay time of YAP (40ns) is faster than YAG (80ns) so its overall performance is superior to YAG. YAP crystals should be coated with 50nm of aluminum prior to use.




| Dia. (mm) x Thick (mm) | Instrument | Cat.# P-47 | Cat.# YAG | Cat.# YAP |
|---|---|---|---|---|
| 6.2 x 1 | Phillip Quad Detector | 82010 | 82040 | 82070 |
| 7.5 x 1 | ISI Mini-SEM | 82012 | 82042 | 82072 |
| 8.8 x 2 | Jeol JSM T20, T200, T300, 340 | 82013 | 82043 | 82073 |
| 9.0 x 3 | ETEC | 82014 | 82044 | 82074 |
| 10.0 x 1 | Cambridge except S600, AMRAY 1200 | 82016 | 82046 | 82076 |
| 12.0 x 1 | Cambridge S600 | 82017 | 82047 | 82077 |
| 12.0 x 0.17 | Zeiss SEM | 82018 | 82048 | 82078 |
| 12.4 x 3.2. | Cameca | 82020 | 82050 | 82080 |
| 13.7 x 1 | ISI Mini-SEM, Jeol | 82021 | 82051 | 82081 |
| 16.4 x 0.17 | Novascan, SEMCO/Zeiss | 82022 | 82052 | 82082 |
| 18.0 x 1 | Camscan, Balscan, Cambridge S-4 | 82024 | 82054 | 82084 |
| 19.0 x 1 | Jeol U3, JSM2 | 82026 | 82056 | 82086 |
| 19.0 x 7.3. | ARL SEMQ | 82028 | 82058 | 82088 |
| 19.8 x 1 | Hitachi w/metal ring. | 82029 | 82059 | 82089 |
| 20.0 x 1 | AMRAY except 1200, Jeol 50A, 35,Hitachi | 82030 | 82060 | 82090 |
| 20.0 x 2 | Philips SEM | 82032 | 82062 | 82092 |

Note: P-47 is usually in-stock. YAG and YAP delivery time is 6-8 weeks.

## Light Pipe Scintillators



The light pipe is the connection between the scintillator and the phosphomultiplier tube (PMT). It transfers the photons produced by the scintillator for detection by the PMT. We coat the scintillator material directly on the light pipe which improves the signal. Light Pipes are available in optical quality quartz and optical grade acrylic. Cambridge reduced-tip models are only available in acrylic. High voltage wire and corona ring are included. JEOL pipes include a flange. Price includes one Re-coating Certificate. Re-coating is typically needed twice per year.

**P47P Light Pipes**

| Microscope | Substrate | Style | Length | Cat. No. |
|---|---|---|---|---|
| Cambridge | Quartz | Angled | —— | 82000-10 |
| Cambridge | Quartz | Straight | 74mm | 82000-74 |
| Cambridge | Quartz | Straight | 89mm | 82000-89 |
| Cambridge | Quartz | Straight | 104mm | 82000-104 |
| Cambridge | Quartz | Straight | Up to 200mm | 82000-x * |
| Cambridge | Acrylic | Reduced Tip | 88mm | 82001-88 |
| Cambridge | Acrylic | Reduced Tip | 100mm | 82001-100 |
| Cambridge | Acrylic | Reduced Tip | 120mm | 82001-120 |
| Cambridge | Acrylic | Reduced Tip | Any | 82001-x* |
| JEOL U-2, U-3 | Quartz | 1/4" Collar | 60mm | 82004-60 |
| JEOL JSM-35 | Quartz | 1/2" Collar | 60mm | 82005-60 |
| Re-coating Service | ———— | Various | ————- | 82008-RS |

**** Replace the asterisk by the length of the Light Pipe.***

# SEM SUPPLIES

## SEM Clip Specimen Mounts

*Specially designed for easy, quick and clean mounting of any type of thin specimen on specimen stubs.*

These spring-loaded clips accommodate samples of up to 2mm thickness. Samples are held securely by small spring-loaded clips and allow for easy change of samples. Adhesives are not required, eliminating possible outgassing issues and saving time

- **Available with single and multiple clips**
- **Ideal for holding silicon chips, paper, wire, threads, thin films, sheet metal, etc.**
- **SEM Clip Mounts with multiple clips can hold larger samples or multiple smaller samples.**

### 18mm Dia., Pin Mount

For FEI/Philips, ZEISS/LEO, Cambridge, Leica, Amray, CamScan and Tescan SEMs. Made in USA. Mount with one clip

| | | |
|---|---|---|
| **75923-10** | SEM Clip, 18mm Pin Mount, 1 clip | each |

Shorter version for ZEISS/LEO SEM/FIBs with 6mm pin height

| | | |
|---|---|---|
| **75923-11** | SEM Clip, 18mm Pin Mount, 6mm pin height, 1 clip | each |

### 25mm Dia., Pin Mount

Available with one, two or three clips

**75923-12** **75923-13** **75923-14** **side view**

| | | |
|---|---|---|
| **75923-12** | SEM Clip, 25mm Pin Mount, 1 clip | each |
| **75923-13** | SEM Clip, 25mm Pin Mount, 2 clips | each |
| **75923-14** | SEM Clip, 25mm Pin Mount, 3 clips | each |

Shorter version for ZEISS/LEO SEM/FIBs with 6mm pin height

| | | |
|---|---|---|
| **75923-15** | SEM Clip, 25mm Pin Mount, for ZEISS/LEO SEM/FIBs 6mm pin height, 1 clip | each |
| **75923-16** | SEM Clip, 25mm Pin Mount, for ZEISS/LEO SEM/FIBs 6mm pin height, 2 clips | each |
| **75923-17** | SEM Clip, 25mm Pin Mount, for ZEISS/LEO SEM/FIBs 6mm pin height, 3 clips | each |

### 32mm Dia., Pin Mount

Available with one, two, or three clips

**75923-18** **75923-19** **75923-20** **side view**

| | | |
|---|---|---|
| **75923-18** | SEM Clip, 38mm Pin Mount, 1 clip | each |
| **75923-19** | SEM Clip, 38mm Pin Mount, 2 clips | each |
| **75923-20** | SEM Clip, 38mm Pin Mount, 3 clips | each |

### 38mm Dia., Pin Mount

Available with one, two or three clips

**75923-21** **75923-22** **75923-23** **side view**

| | | |
|---|---|---|
| **75923-21** | SEM Clip, 38mm Pin Mount, 1 clip | each |
| **75923-22** | SEM Clip, 38mm Pin Mount, 2 clips | each |
| **75923-23** | SEM Clip, 38mm Pin Mount, 3 clips | each |

### 25mm Dia., Cylinder Mount, M4

Available with one, two, or three clips. For Hitachi

**75930-05** **75930-10** **75930-20** **bottom view**

| | | |
|---|---|---|
| **75930-05** | SEM Clip, 25x6mm x M4 Cylinder Mount, 1 clip | each |
| **75930-10** | SEM Clip, 25x6mm x M4 Cylinder Mount, 2 clips | each |
| **75930-20** | SEM Clip, 25x6mm x M4 Cylinder Mount, 3 clips | each |

### 32mm Dia., Cylinder Mount, M4

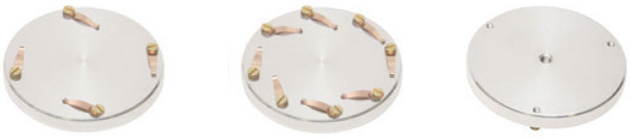
Available with one, two, or three clips. For Hitachi

**75930-15** **75930-25** **75930-35** **bottom view**

| | | |
|---|---|---|
| **75930-15** | SEM Clip, 32x10mm x M4 Cylinder Mount, 1 clip | each |
| **75930-25** | SEM Clip, 32x10mm x M4 Cylinder Mount, 2 clips | each |
| **75930-35** | SEM Clip, 32x10mm x M4 Cylinder Mount, 3 clips | each |

### 50mm Dia., Cylinder Mount, M4

**75954-15** **75954-25** **75954-30**



**75954-35** **75954-40** **bottom view**

| | | |
|---|---|---|
| **75954-15** | SEM Clip, 50x6mm x M4 Cylinder Mount, 1 clip | each |
| **75954-25** | SEM Clip, 50x6mm x M4 Cylinder Mount, 2 clips | each |
| **75954-30** | SEM Clip, 50x6mm x M4 Cylinder Mount, 3 clips | each |
| **75954-35** | SEM Clip, 50x6mm x M4 Cylinder Mount, 4 clips | each |
| **75954-40** | SEM Clip, 50x6mm x M4 Cylinder Mount, 8 clips | each |



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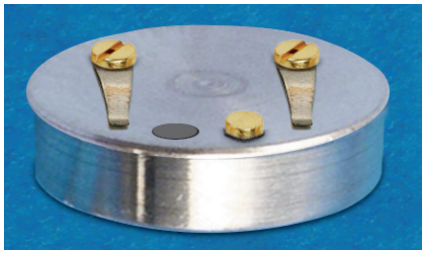
## SEM Clip Specimen Mounts (continued)

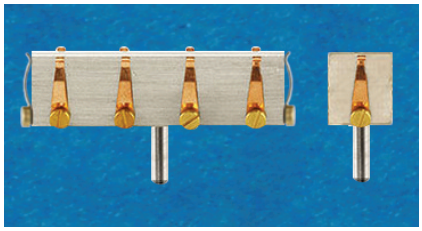
### E-Beam Lithography Mount



This mount, made from aluminum features an M4 threaded hole and is 25mm in diameter. The clips are made from copper. The mount comes complete with a Faraday Cup (2.5mm x 100nm hole) and a gold/carbon resolution sample 3mm in diameter is included. The gold particle size range is 5–150nm

| | | |
|---|---|---|
| **75944-15** | E-Beam Lithography Mount, M4 | each |

### Specimen Block, 10 Clips

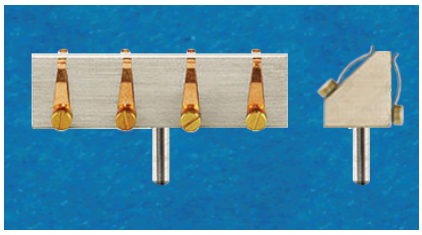


This block is engraved, numbered 1–10. Measures 12 x 48mm.

Comes complete with pin.

| | | |
|---|---|---|
| **75955-03** | Specimen Block, 10 clips | each |

### Specimen Block, 8 Clips



This block is engraved, numbered 1–8. Measures 12 x 48mm.

Comes complete with pin.

| | | |
|---|---|---|
| **75955-04** | Specimen Block, 8 clips | each |

### Replacement Clips and Screws

Clips are made from spring grade beryllium-copper alloy. Thickness: 0.25mm (0.01"), overall length: 12.7mm (1/2"), width at tip: 1.6mm (1/16"), hole diameter: 2.2mm (0.087").

| | | |
|---|---|---|
| **75954-06** | SEM Clips | 10/pk |
| **75954-07** | SEM Screws, Brass, M2 x 3mm length | 10/pk |

### Mini SEM Clamp 10mm, 15mm Diameter

Aluminum Mini SEM clamp on a 10mm, 15mm diameter M4 cylinder mount. Convenient for holding flat or thin specimens such as silicon chips, wires, foil and small tubes.

Screw is M2 x 3mm, pan head screw, brass.

| | | |
|---|---|---|
| **75955-19** | Mini SEMClamp 10mm, 15mm diameter, M4 | each |

### Mini SEM Clamp, 12.7mm

Mini SEM Clamp on a standard 12.7mm (1/2") pin stub. Suitable for holding flat or thin specimens such as silicon chips, foil, wires, and small tubes.

**Material:** Vacuum-grade aluminum with brass screw.

| | | |
|---|---|---|
| **75954-01** | Mini SEM Clamp 12.7mm, Pin | each |

### Small SEM Clamp, 15 x 10mm

15mm (0.6") long with 10mm (0.4") wide clamping area and standard pin stub 3.2mm (1/8"). Suitable for holding samples up to 7mm overall thickness. Perfect for small tubes, strips, wires, and smaller flat samples.

**Overall Dimensions** 23 x 20 x 9mm (0.9"x0.78"x0.35")

**Material:** Machined aluminum with brass screws.

| | | |
|---|---|---|
| **75954-02** | Small SEM Clamp 15 x 10mm, 3.2mm (1/8") Pin | each |

### Medium SEM Clamp, 25 x 15mm

25mm (1") long with 15mm (0.6") wide clamping area. Features standard pin stub 3.2mm (1/8"). Suitable for holding samples up to 7mm overall thickness. Perfect for small tubes, strips, wires, and smaller flat samples.

**Overall Dimensions:** 33 x 25 x 9mm (1.3"x1"x0.35")

**Material:** Machined aluminum with brass screws.

| | | |
|---|---|---|
| **75954-03** | Medium SEM Clamp 25 x 15mm, 3.2mm (1/8") Pin | each |

### Recessed SEM Clamp, 25 x 15mm

Achieve background-free imaging and no contact with sample surface in imaging area with this 5mm recessed clip

**Clamping Area:** 25mm (1") long X 15mm (0.6") wide.

**Maximum Thickness:** 7mm under the clamping strips.

**Overall Dimensions:** 33 x 25 x 11mm 1.3"x1"x0.43").

**Material:** Machined aluminum with brass screws.

| | | |
|---|---|---|
| **75954-05** | Recessed SEM Clamp 25 x 15mm, 3.2mm (1/8") Pin | each |

# SEM SUPPLIES

## Specially Designed Specimen Holders for SEM

Our specimen holders are designed to improve your productivity and allow you to view more than one sample at a time. You will save pump down time, keep your chamber cleaner and get more work done. All mounts are machined from solid aluminum and come with spring clips/or set-screws to hold your specimens securely. All mounts are made to fit onto your stage and are designed to fit through all standard specimen exchange ports, and have a center-threaded port to accept the Adapter Pins. Be sure to order the Adapter Pin that fits your instrument. For this reason, we offer three different types of pin adapters, which are threaded and ready to screw on to the base of the holders.

**Adapter A:** Overall measurement: 28mm long x 3.1mm diameter (step-up portion is 6.25mm L x 4.8mm diameter)

**Adapter B:** Overall measurement: 28mm long x 6mm diameter

**Adapter C:** Overall measurement: 34.5mm long x 16mm diameter

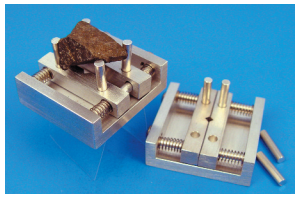
All adapters have a threaded portion 5mm in length.

75930

### 1/ Universal SEM Sample Holder

This holder will hold almost any sample from 3mm to 29mm in diameter plus various odd shaped samples, which one of their dimensions is not greater than 29mm. The samples are easily inserted or removed from the holder. The holder is made from aluminum and is supplied with four removable sample arms so that it can hold very small samples as well, and it provides good electrical contact to the stage. The AMRAY base is the standard base and it measures: 48mm x 42mm x 12mm Thick.

For all other makes and models you can choose an Adapter Pin to screw on to the AMRAY base holder.



75910


Adapter Pins

| Cat. # | Description | Qty |
|---|---|---|
| 75910 | Universal SEM Holder – AMRAY Base | each |
| 75910-01 | Universal SEM Holder – AMRAY Base with Pin A | each |
| 75910-02 | Universal SEM Holder – AMRAY Base with Pin B | each |
| 75910-03 | Universal SEM Holder – AMRAY Base with Pin C | each |

### 2/ Vertical Mounts for Thin Samples

This holder is designed to hold thin samples vertically in the SEM or any microscope. It is 25mm in diameter and 10mm thick. Each of the two jaws can hold up to 3mm thick samples. The spring loader is gentle and strong enough to keep thin and fragile samples vertical so that cross sections can be studied. This holder is very useful for cross sections of silicone wafers or multiplayer capacitors.

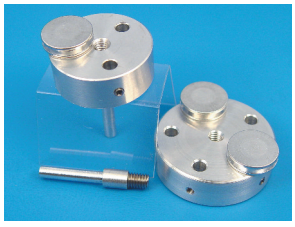
This holder can be adapted to any adapter pin listed above to accommodate your instrument.

75915

| Cat. # | Description | Qty |
|---|---|---|
| 75915 | Thin Sample/Vertical Mount Holder, Flat Base | each |
| 75915-01 | Thin Sample/Vertical Mount Holder, with Adapter Pin A | each |
| 75915-02 | Thin Sample/Vertical Mount Holder, with Adapter Pin B | each |
| 75915-03 | Thin Sample/Vertical Mount Holder, with Adapter Pin C | each |

### 3/ Multi Pin Holder

The multi Pin Holder is designed to save time. It accommodates 3 or 5 of ½" (12.5mm) diameter surface, 1/8" (3.1mm) diameter pin.



75920

| Cat. # | Description | Qty |
|---|---|---|
| 75920 | 3-Pin Holder, 25mm Dia x 10mm H, Flat Base | each |
| 75920-01 | 3-Pin Holder, 25mm Dia x 10mm H, with Adapter Pin A | each |
| 75920-02 | 3-Pin Holder, 25mm Dia x 10mm H, with Adapter Pin B | each |
| 75920-03 | 3-Pin Holder, 25mm Dia x 10mm H, with Adapter Pin C | each |
| 75921 | 5-Pin Holder, 32mm Dia x 10mm H, Flat Base | each |
| 75921-01 | 5-Pin Holder, 32mm Dia x 10mm H, with Adapter Pin A | each |
| 75921-02 | 5-Pin Holder, 32mm Dia x 10mm H, with Adapter Pin B | each |
| 75921-03 | 5-Pin Holder, 32mm Dia x 10mm H, with Adapter Pin C | each |

### SEM Sample Holders Set

For your convenience, we now offer a SEM Sample Holder Set for the above SEM Holders in a solid wooden box and finely finished. Set consists of one Universal Holder, one Thin Sample/Vertical Mount Holder, one each 3-Pin and 5-Pin Holders with a hex hey and Adapter Pin A.

| | | |
|---|---|---|
| 75930 | SEM Sample Holder Set | each |



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## Specimen Holders (continued)

### SEM Stub Freeze Dry Holder

Our aluminum stub holder offers many uses, including holding ⅛" (3.1 mm) pin stubs for freeze drying.

Diameter: 38 mm (H) with five holes to hold five pin stubs.

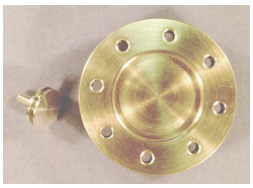
| | | |
|---|---|---|
| **EMS001** | SEM Stub Freeze Dry Holder | each |

### Cambridge Pin Stub Adapter

This adapter will convert ⅛" (3.1 mm) pin stub holders to the re-entrant type 1¼" (32 mm).

| | | |
|---|---|---|
| **EMS002** | Cambridge Pin Stub Adapter | each |

### Cambridge SEM Carousel



A standard carousel holder made to fit Cambridge SEMs. Will hold 8 pin stubs. Comes complete with hexagonal wrench.

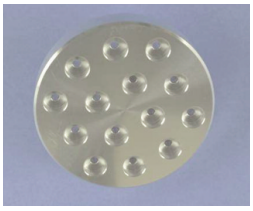
| | | |
|---|---|---|
| **EMS030** | Cambridge SEM Carousel | each |

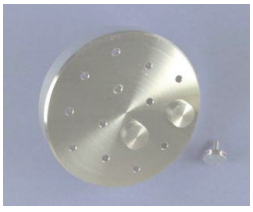
### Cambridge Universal Stub Adapter

Universal adapter to fit Cambridge SEMs which then accepts interchangeable multi carousel, single pin stubs, or re-entrant stubs.

| | | |
|---|---|---|
| **EMS036** | Interchangeable Carousel Adapter | each |
| **EMS037** | Interchangeable Carousel | each |

### Dual Size SEM Sample Holder



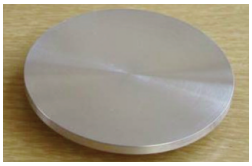


A simple holder which will hold ⅛" (3.1 mm) pin stubs on one side, or any other solid stub in the other side. Useful for specimen preparation, coating, freeze drying, as well as storage.

Available in three sizes.

| | | |
|---|---|---|
| **EMS003** | Dual Size SEM Sample Holder, 15 mm | each |
| **EMS004** | Dual Size SEM Sample Holder, 10 mm | each |
| **EMS004A** | Dual Size SEM Sample Holder, 12.5 mm | each |

### 3" (75 mm) Diameter SEM Stub



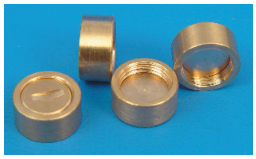
A larger SEM sample holder for larger samples.

Material: Aluminum

Available for all microscopes – Four sizes available.

| | | |
|---|---|---|
| **EMS025A** | 3" (75 mm) Diameter SEM Stub, 10 mm | each |
| **EMS025B** | 3" (75 mm) Diameter SEM Stub, 12.5 mm | each |
| **EMS025C** | 3" (75 mm) Diameter SEM Stub, 15 mm | each |
| **EMS025D** | 3" (75 mm) Diameter SEM Stub, 19 mm | each |

### ISI DS 130 and 150 First Stage Sample Mounts



**75925**

10mm in diameter, 5mm high, copper sample holder to fit the stage of the ISI DS 130 and 150 SEMs. The inner cylinder is height adjustable so that you can adjust the sample to the correct working distance.

| | | |
|---|---|---|
| **75925** | ISI First Stage Holder | each |

### Pin Mount Stub Adapters

Made from aluminum, used to adapt 1⁄8" (3.1mm) pin diameter SEM stubs. Available in 10, 15 and 16mm diameters.

| | | |
|---|---|---|
| **75940-10** | Pin Stub Adapter 10mm (H) x 10mm (D) | each |
| **75940-11** | Pin Stub Adapter 15mm (H) x 10mm (D) with M4 tapered hole on one side | each |
| **75940-15** | Pin Stub Adapter 38mm (H )x 15mm (D) with M4 tapered hole on one side | each |
| **75940-16** | Pin Stub Adapter 38mm (H) x 16mm (D) | each |

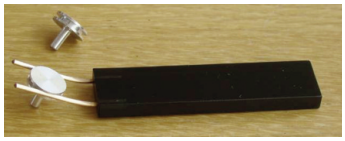
### SEM Pin Stub Adapters

A simple to use adapter which will convert Hitachi, JEOL or ISI microscopes to use ⅛" pin stubs or Cambridge stubs.

Made of aluminum with spring retainers which will give a good connection.

| | | |
|---|---|---|
| **EMS060** | SEM Pin Stub Adapter, 10 mm | each |
| **EMS061** | SEM Pin Stub Adapter, 15 mm | each |
| **EMS062** | SEM Pin Stub Adapter, 12.5 mm | each |

### SEM Stub Tool



A useful tool for assisting in loading and unloading SEM pin stubs from a loading stand or specimen box into the microscope.

It features a Perspex handle with beryllium copper pins that give the tool a flexible, but stable, grip on the specimen stub.

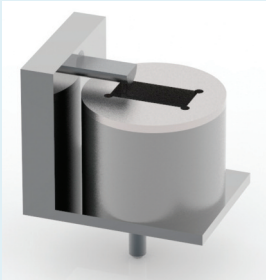
| | | |
|---|---|---|
| **EMS005** | SEM Stub Tool | each |

# SEM SUPPLIES

## Specimen Holders (continued)

NEW

### EMS Orbital Specimen Holder



Take the new EMS Orbital Specimen Holder for a spin and raise your SEM images to a whole new level. Experience flexibility and control superior to any other specimen holder. This unique holder is a tool no SEM laboratory should be without.

The EMS Orbital Specimen Holder's clever design allows you to effortlessly rotate the specimen completely around an axis. The pot is coated to reduce noise, producing a black background behind the subject so every detail stands out, allowing the capture of stunning, clear images.

#### Features

- **Rotate 360° around the axis perpendicular to the electron beam**
- **Pot is detached, fully re-positionable below the pivoted mount**
- **Control and hold the position of the sample with the simple turn of a screw**
- **Available in Pin or M4 Mount versions**

| Overall Dimensions: | |
|---|---|
| **Pin Mount** | 1.25" (L) x 1" (W) x 1.5" (H) |
| **M4 Mount** | 1.25" (L) x 1" (W) x 1.125" (H) |

#### TECHNICAL TIP

EMS Orbital Specimen Holder Use

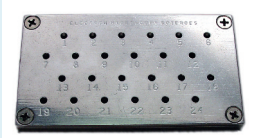
- Adhere the specimen to a pin, sputter coat and attach to the pivoted mount on the holder
- Position the rectangular window of the coated pot under the specimen to absorb electrons in the chamber
- Manipulate and hold the specimen in place at the desired angle using a screwdriver

#### Ordering Information

| | | |
|---|---|---|
| **75911** | EMS Orbital Specimen Holder, Pin Mount | each |
| **75912** | EMS Orbital Specimen Holder, M4 Mount | each |

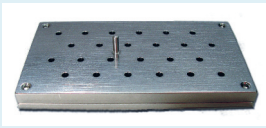
### 24 Place SEM Holder

These 24 place holder is made from Aluminum and offers a stage travel of 100mm x 50mm (which is perfect to be used with the Hitachi VP SEM) .. The holder has a unique identification number so every hole is identifiable



*front*

The holder measures 4 7/16" (112.7mm) x 2 ½ " ( 63.5mm) x 3/8" (10mm ) (L x W x H) and has an 1/8" (3.2mm) mounting pin .



*back*

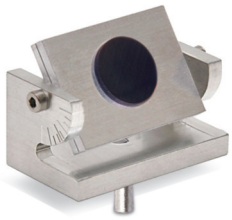
| | | |
|---|---|---|
| **75958-67** | 24 Place SEM holder | each |

### Variable Tilt Mount

This mount which is made from aluminum is used for the mounting and tilting of samples from 0° – 90° as well as for SEM investigation with small working distances. The mount is marked for 30°, 45°, 70° and 90°. The table measures 11 x 11mm (0.46" x 0.46") and the overall size is 14 x 14 x12.7mm (0.55"x 0.55"x 0.5").

| | | |
|---|---|---|
| **75952-05** | Variable Tilt Mount holder, For Pin | each |
| **75952-05H** | Variable Tilt Mount, M4 Hitachi | each |

### Variable Tilt Specimen Holder



This tilt mount, made from aluminum, is used for the mounting and tilting of samples from 0˚ – 90˚ in 10˚ increments. Allows for pin stubs up to 18mm and fits specimens with a maximum size of 26mm x 22mm.

Comes complete with screws and allen wrench.

| | | |
|---|---|---|
| **75952-65** | Variable Tilt Specimen Holder | each |

### 45° Pin Stub Holder

This 45 degree pin stub holder allows for a higher SE signal without having to tilt the specimen stage and it accommodates any standard 12.7 mm (½") pin stubs with 3.2 mm (⅛") pin.. Grooved, machined aluminum with stainless steel Allen set screw.

| | | |
|---|---|---|
| **75952-45** | 45° Pin Stub Holder, 3.2 mm (⅛") pin | each |

### Thin Sample Holder

Ideal for the examination of cross sections of thin samples, such as wafers, multi-layer of capacitors, plastics, metals, etc.

**1. For most AMRAY:** ½" diameter (12.7mm), ⅛" (3.1mm) diameter pin (3.1mm) with split openings up to ¼" (6.4mm). Available with either 8mm (5/16") pin height or 15mm (9/16") pin height.

| Cat No. | Description | Qty. |
|---|---|---|
| **75948-08** | Thin Film Holder, 8mm(L) Pin | each |
| **75948-15** | Thin Film Holder, 15mm (L) Pin | each |

**2. For ISI, JEOL, TOPCON:** Double set screw for a secure holding of the specimen during observation. 15mm(9/16") (dia). x 10mm(⅜") (H), 6.4mm (¼") split.

| Cat No. | Description | Qty. |
|---|---|---|
| **75948-10** | Thin Film Holder, 15x10mm Stub | each |



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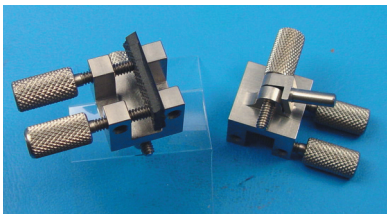
## Specimen Holders (continued)

### Cross Sectional Holder

Made from non-magnetic stainless steel with 3.1mm (1⁄8") diameter pin and adjustable angle turn-screw. Just insert specimens edge-on and observe the cross section directly.

| Cat No. | Description | Qty. |
|---|---|---|
| **75942-01** | Cross Sectional Holder | each |



### 45° Pin Mount and 90° Profile, Combination Holder

*For Hitachi S-800, S-4000, S-4100, S-4200, S-4300, S-4500, S-4700 and S-3600N SEMs.*

For cross sections up to 6.35mm (1/4"). Available in aluminum or brass with stainless steel allen set screws. Includes allen wrench.

| Cat No. | Description | Qty. |
|---|---|---|
| **75950-07-A** | 45°/90° Combination Holder, Aluminum | each |
| **75950-07-B** | 45°/90° Combination Holder, Brass | each |

**75950-07-A**

**75950-07-B**

### Wafer Holders

These wafer holders are made from aluminum and feature brass clips which secure the wafers. Each holder comes with a 1/8" (3.2mm) pin of 3/8" (9.5mm) length.

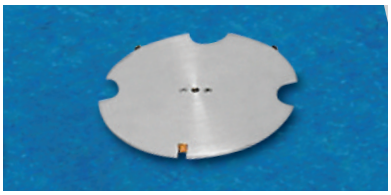
Available in five sizes to accommodate a variety of wafers.

**75958-11**

**75958-12**

**75958-13**

| Cat No. | Description | Qty. |
|---|---|---|
| **75958-11** | Wafer Holder for 1" (25mm) dia. | each |
| **75958-12** | Wafer Holder for 2" (51mm) dia. | each |
| **75958-13** | Wafer Holder for 3" (76mm) dia. | each |
| **75958-14** | Wafer Holder for 4" (100mm) dia. | each |
| **75958-15** | Wafer Holder for 6" (150mm) dia. | each |



**75958-14**

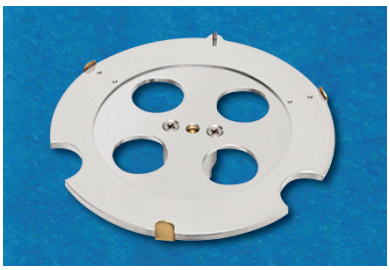
**75958-15**

### Wafer Holders, Notch Style

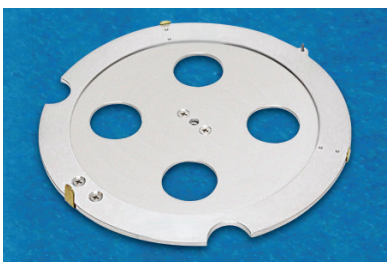
These wafer holders are made from aluminum and feature brass clips which secure the wafers. Each holder comes with a 1/8" (3.2mm) pin of 3/8" (9.5mm) length.

Available in two sizes to accommodate a variety of wafers.

| Cat No. | Description | Qty. |
|---|---|---|
| **75958-16** | Wafer Holder for Notch Style Wafers, 4" (100mm), Pin | each |
| **75958-17** | Wafer Holder for Notch Style Wafers, 6" (150mm), Pin | each |



**75958-16**



**75958-17**

## RELATED PRODUCTS...

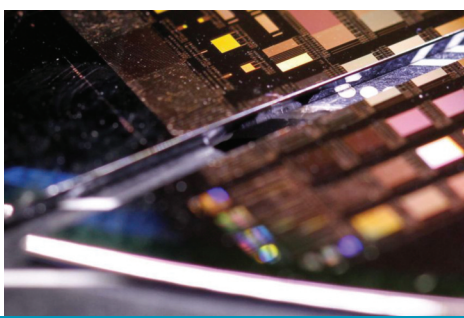
Cleaving & Scribing Systems And Tools


### NEW! LatticeAx™ 225

*Accurate Indent and Cleaving System*

The addition of high magnification imaging enables accurate indenting, resulting in samples cleaved with high accuracy. The LatticeAx™ 225 delivers 20µm accuracy with high quality cleaved surfaces in 5 min. It integrates the patent pending LatticeAx™ base with an industrial platform customized for indenting and cleaving..

**See pages 120–123.**

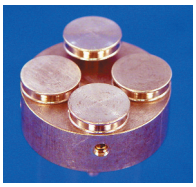


# SEM SUPPLIES

## Specimen Holders (continued) / MULTIHOLDERS

### Four-Pin Stub Holder

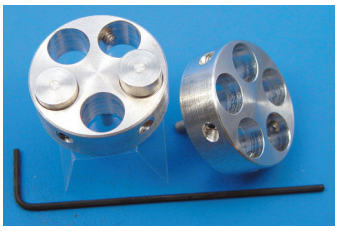
It accommodates four pin types, up to 12.5 (½") surface specimen stubs, with ⅛" (3.1mm) diameter pin.



| | | |
|---|---|---|
| **75944-04** | Four-Pin Stub Holder | each |

### Five 10mm Stub Holder

Accommodates five 10mm diameter specimen stubs, with ⅛" (3.1mm) diameter pin.



| | | |
|---|---|---|
| **75945-05** | Five 10mm Stub Holder | each |

### Multi Holder for 4 Pin Stubs

This multi pin stub adapter for JEOL 32x11mm is designed to save time It is made from vacuum aluminum with stainless steel set screws. It accommodates up to four standard 12.7mm (½") pin stubs with 3.2mm (⅛") pin.

| | | |
|---|---|---|
| **75953-02J** | Multi Pin Stub Adapter, Jeol | each |

### Multi Holder for 6 Pin Stubs

This 42mm in diameter multi pin holder is designed to save time It is made from machined aluminum with stainless steel set screws. It accommodates up to six standard 12.7mm (½") pin stubs with 3.2mm (⅛") pin.

| | | |
|---|---|---|
| **75953-25h** | Multi Holder for 6 Pin Stubs, Hitachi, M4 | each |

### Multi Holder for 8 Pin Stubs

This 50mm in diameter multi pin holder is designed to save time It is made from machined aluminum with stainless steel Allen wrench screws. It accommodates up to eight standard 12.7mm (½") pin stubs.

| | | |
|---|---|---|
| **75952-08** | Multi Pin Holder for 8 Pin Stubs, 3.2mm (⅛") | each |
| **75952-08H** | Multiple Holder for 8 Pins Hitachi, M4 | each |
| **75952-08ZE** | Multiple Holder for 8 Pins Zeiss, 46mm OD x 14mm H with Built-in Dovetail | each |

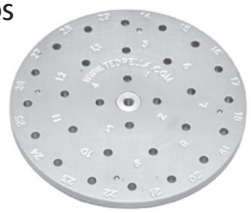
### Multi Pin Holder for 12 Pin Stubs

This 62 mm in diameter multi pin holder is designed to save time It is made from machined aluminum with stainless steel Allen wrench screws. It accommodates up to twelve standard 12.7mm (½") pin stubs

| | | |
|---|---|---|
| **75952-12** | Multi Pin Holder for 12 pin stubs, 3.2mm(1/8") | each |
| **75952-12H** | Multi Holder for 12 Pin Stubs, Hitachi, M4 | each |
| **75952-12ZE** | Multi Holder for 12 Pin Stubs, Zeiss 62mm OD x 14mm H with Built-in Dovetail | each |

### Multi Holder for 29 Pin Stubs

This 90 mm in diameter multi pin holder is designed to save time It is made from machined aluminum with 302 stainless steel springs that hold the pin stubs in place. It accommodates up to twenty nine standard 12.7mm (½") pin stubs



| | | |
|---|---|---|
| **75952-29** | Multi Pin Holder for 29 pin stubs, 3.2mm (⅛") | each |
| **75952-29H** | Multi Holder for 29 pin Stubs, Hitachi, M4 | each |

### Multi Holder for 49 Pin Stubs

This 117 mm in diameter multi pin holder is designed to save time It is made from machined aluminum with 302 stainless steel springs that hold the pin stubs in place. It accommodates up to forty nine standard 12.7mm (1/2") pin stubs

| | | |
|---|---|---|
| **75952-49** | Multi Pin Holder for 49 pin stubs, 3.2mm (⅛") | each |
| **75952-49H** | Multi Holder for 49 pin Stubs, Hitachi, M4 | each |

### 45° Multi Holder for 3 Pin Stubs

This 25.4 mm in diameter 45º multi pin holder is designed to save time. It allows for a higher SE signal without having to tilt the specimen. It is made from machined aluminum with stainless steel Allen set screws. It accommodates up to three standard 12.7mm (½") pin stubs with 3.2mm (⅛") pin.

| | | |
|---|---|---|
| **75952-60** | 45° Multi Holder for 3 pin stubs, | each |

### 45° Multi Holder for 6 Pin Stubs

This 35 mm in diameter 45º multi pin holder is designed to save time. It allows for a higher SE signal without having to tilt the specimen It is made from machined aluminum with stainless steel Allen set screws. It accommodates up to six standard 12.7mm (½") pin stubs.

| | | |
|---|---|---|
| **75952-70** | 45° Multi Holder for 6 pin stubs, 3.2mm (⅛") | each |
| **75952-70H** | 450 Multi Holder for 6 pin stubs, Hitachi, M4 | each |



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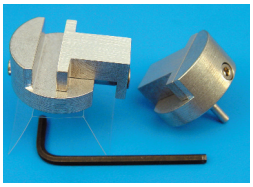
## Universal Vise



A single set screw loading vise for fast and easy to hold specimens for SEM. The jaws are 1" (25mm) long, 7/16" (11mm) wide and 5/16" (8mm) high. 1/8" (3.1mm) pin.

**75950-01** Universal Vise each

## Set Screw Vise

This set screw vice which is made from machined aluminum with stainless steel allen set screws has an open slot that is 4mm (.157") wide x 5mm (.197") deep. It measures 12.7mm (½") dia. x 17.7mm (0.70") high. And has a 3.2mm (⅛") dia. pin.

**75941-01** Set Screw Vise, 12.7mm each

## Large Set Screw Vise

**75941-03**

This set screw vice which is made from machined aluminum with stainless steel allen set screws has an open slot that is 10mm (.394") wide x 5mm (.197") deep. It measures 25mm (1") dia. x 17.5mm (0.69") high.

**75941-03H**

| | | |
|---|---|---|
| **75941-03** | Large Set Screw Vise, 25mm, 3.2mm (1/8") Pin | each |
| **75941-03H** | Large Set Screw Vise, 25mmx10mm (H), M4 | each |

## Thin Specimen Split Mount on Pin Stub

**75950-08**

12.7mm (1/2") dia., 3.2mm (1/8") dia. pin.

For examination of thin samples from paper, plastics, metals, textiles, plants, etc., in cross section. Features a wide opening up to 6.4mm (1/4"). Grooved head. Height of head is 7.4mm (0.29").

**Pin Length:** 8mm (.314"). Pin is centered.

**Material:** Machined aluminum with stainless steel allen set screw. Includes allen wrench.

**75950-08** Thin Specimen Split Mount, 1/2", 8mm L pin each

## Thin Specimen Split Mount (AMRAY), 15mm

**75950-09**

15mm (0.59") dia., 3.2mm (1/8") dia. pin

Opens to 3.75mm (3/8").

**Pin length:** 14.3mm (9/16")

**Height of head:** 10.2mm (0.4"), centered split. Pin is off-center.

**Material:** Machined aluminum with two stainless steel allen set screws. Includes allen wrench.

**75950-09** Thin Specimen Split Mount, AMRAY each

## Double Slot Mini Vise

Double-slot set screw vise with (2) 1mm wide x 3mm deep slots. Clamp thin specimens or cross sections. Effectively holds wafers and thin samples up to 1mm (.039") thick.

**Dimensions:** 15mm dia x 6mm H.

**Material:** Aluminum with 2 stainless steel allen set screws. Includes allen wrench.

**75943-H** Double Slot Set Screw Vise, M4, 15 x 6mm H each

## Double Slot Mini Vise, 15mm

(2) 1mm wide X 3mm deep slots. Clamp thin specimens and cross sections without tape or conductive paint.

**Pin Length:** 3.2mm (1/8").

**Material:** Machined aluminum with 2 stainless steel allen set screws. Includes allen wrench.

**75951-03** Double Slot Set Screw Vise, 15mm each

## Large Double Slot Vise, 25mm

Features (2) 2.5mm by 5mm deep slots. Clamp thin specimens and cross sections without conductive paint or tape.

**Dimensions:** 25 x 8 mm (1 x 0.32") with 3.2mm (1/8") pin.

**Material:** Machined aluminum with 2 stainless steel allen set screws. Includes allen wrench.

**75951-04** Large Double Slot Set Screw Vise, 25mm each

## Large Double Slot Vise, 25mm

Large Double-Slot Set Screw Vise with (2) 2.5mm X 5mm deep slots. Clamp thin specimens and cross sections without conductive paint or tape.

**Dimensions:** 25 x 10 mm (1 x 0.4").

**Material:** Machined aluminum with 2 stainless steel allen set screws. Includes allen wrench.

**75947-H** Large Double Slot Set Screw Vise, 25mm x 10mm H, M4 each

## Large Double Slot Vise, 32mm

32mm Large double slot set screw vise with (2) 2.5mm wide X 5mm deep slots.

Clamp thin specimens and cross sections without conductive paint or tape.

**Dimensions:** 32 X 10mm (1-1/4" x 0.394")

**Material:** Machined aluminum with 2 stainless steel allen set screws. Includes allen wrench.

**75947-HH** Large Double Slot Set Screw Vise, 32 x 10mm, M4 each

# SEM SUPPLIES

## Specimen Holders (continued) / METALLURGICAL MOUNTS, EBSD HOLDERS

### Metallurgical Mount Holder, 1" (25mm)

This mount holder which is made from machined aluminum with stainless steel Allen screws is specifically for 1" (25mm) metallurgical mounts.

| | | |
|---|---|---|
| **75941-05** | Metallurgical Mount Holder, 1" (25mm), 3.2mm (⅛") x 8mm (D) | each |
| **75941-05H** | Metallurgical Mount Holder, 1" (25mm), Hitachi, M4 | each |

75941-05

75941-05H

### Metallurgical Mount Holder, 1-1/4" (30mm)

This mount holder which is made from machined aluminum with stainless steel Allen screws is specifically for 1¼" (30mm) metallurgical mounts.

| | | |
|---|---|---|
| **75941-06** | Metallurgical Mount Holder, 1¼" (30mm), 3.2mm (⅛") x 8mm (D) | each |
| **75941-06H** | Metallurgical Mount Holder, 1¼" (30mm), Hitachi, M4 | each |

75941-06

75941-06H

### Metallurgical Mount

Accommodates up to 31.8 mm (1¼") diameter of a metallurgical specimen with at least 0.8 mm (⅛") clearance. Pin 3.1 mm (⅛"), depth is 8 mm (5/16").

| | | |
|---|---|---|
| **75952-01** | Metallurgical Mount | each |

### Metallurgical Mount Holder, 1-1/2" (40mm)

This set screw vice which is made from machined aluminum with stainless steel allen set screws has an open slot 10mm (.394") wide x 5mm (.197") deep. Measures 25mm (1") dia. x 17.5mm (0.69") high.

| | | |
|---|---|---|
| **75941-08** | Metallurgical Mount Holder, 1½" (40mm), 3.2mm (⅛") x8mm (D) | each |
| **75941-08H** | Metallurgical Mount Holder 1 ½" (40mm), Hitachi, M4 | each |

75941-08

75941-08H

75941-09

75941-09H

### Metallurgical Mount Holder, 2" (50mm)

This mount holder which is made from machined aluminum with stainless steel Allen screws is specifically for 2" (50mm) metallurgical mounts.

| | | |
|---|---|---|
| **75941-09** | Metallurgical Mount Holder, 2" (50mm), 3.2mm (⅛") x 8mm(D) | each |
| **75941-09H** | Metallurgical Mount Holder, 2" (50mm), Hitachi, M4 | each |

### EBSD Holder, 1" (25mm)

Made from aluminum, this EBSD Holder has a built-in 70˚ pre-tilt angle and accommodates 1" (25mm) mounts.

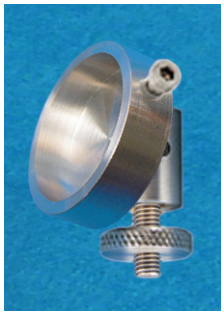
Comes complete with stainless steel screws and allen key.

| | | |
|---|---|---|
| **75944-11** | EBSD Holder, 1" (25mm) Mounts, 70° Pre-Tilt, Pin | each |

### EBSD Holder, 1" (25mm), M4 Compatible

Made from aluminum, this EBSD Holder has a built-in 70˚ pre-tilt angle and accommodates 1" (25mm) mounts.

Comes complete with stainless steel screws and allen key.

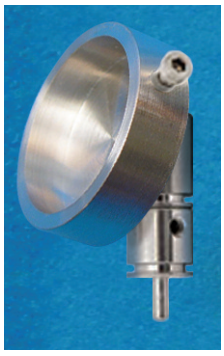


| | | |
|---|---|---|
| **75944-12** | EBSD Holder for 1" (25mm) Mounts, 70° Pre-Tilt, Pin, M4 Compatible | each |

### EBSD Holder, 1-1/4" (32mm)

Made from aluminum, this EBSD Holder has a built-in 70˚ pre-tilt angle and accommodates 1-1/4" (32mm) mounts.

Comes complete with stainless steel screws and allen key.



| | | |
|---|---|---|
| **75944-13** | EBSD Holder, 1-1/4" (32mm) Mounts, 70° Pre-Tilt, Pin | each |

### EBSD Holder, 1-1/4" (32mm), M4 Compatible

Made from aluminum, this EBSD Holder has a built-in 70˚ pre-tilt angle and accommodates 1-1/4" (32mm) mounts.

Comes complete with stainless steel screws and allen key.

| | | |
|---|---|---|
| **75944-14** | EBSD Holder for 1-1/4" (32mm) Mounts, 70° Pre-Tilt, Pin, M4 Compatible | each |



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## SEM Bulk Specimen Holder

*For clamping irregular, bulky samples*

**Opening:** 15.9mm (5/8") wide X 25.4mm (1") long X 9.5mm (3/8") deep.
**Pin Diameter:** 3.2mm (1/8").
**Material:** Machined aluminum with stainless steel allen set screws.
Allen wrench included.

| | | |
|---|---|---|
| **75951-06** | SEM Bulk Specimen Holder | each |

## Large Bulk Specimen Holder

**Opening:** 32mm (1-1/4") wide X 32mm (1-1/4") long X 13mm (1/2") deep.
**Pin Diameter:** 3.2mm (1/8").
**Material:** Machined aluminum with stainless steel allen set screws.
Allen wrench included.

| | | |
|---|---|---|
| **75951-07** | Large Bulk Specimen Holder | each |

## X-Large Bulk Specimen Holder

*Holds up to 2" specimens*

**Opening:** 52mm (2") wide X 40mm (1-1/2") long X 13mm (1/2") deep.
**Pin Diameter:** 3.2mm (1/8")
**Material:** Machined aluminum with stainless steel allen set screws.
Allen wrench included.

| | | |
|---|---|---|
| **75951-08** | X-Large Bulk Specimen Holder | each |

## XX-Large Bulk Specimen Holder

*Holds up to 3" specimens*

**Opening:** 80mm (3-1/8") wide X 48mm (1-7/8") long X 13mm (1/2") deep.
**Pin Diameter:** 3.2mm (1/8").
**Material:** Machined aluminum with stainless steel allen set screws.
Allen wrench included.

| | | |
|---|---|---|
| **75951-09** | XX-Large Bulk Specimen Holder | each |

## Geological Thin Section Holder

**75941-15**

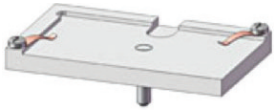
**75941-15H**

This thin section holder is made from aluminum with copper clips and brass screws. The unit measures 55x30x8mm and holds a standard geological thin section or slide measuring 47 x 27mm. The holder comes complete with 2 clips to insure nothing moves. The holder has convenient tweezer inserts which allow for easy loading.

| | | |
|---|---|---|
| **75941-15** | Geological Thin Section Holder, 9.5mm | each |
| **75941-15H** | Geological Thin Section Holder, Hitachi M4 | each |

## Variable Size Geological Thin Section Holder

**75941-16H**



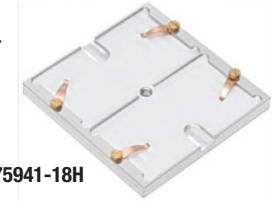
**75941-16**

This thin section holder is made from vacuum grade aluminum with copper clips and brass screws . The unit measures 51x32x8mm and holds either standard thin sections of 47 x 27mm or smaller or larger thin sections. Smallest size would be 40x20mm. The holder comes complete with 2 clips to insure nothing moves. The holder has convenient tweezer inserts which allow for easy loading.

| | | |
|---|---|---|
| **75941-16** | Variable Size Geological Thin Section Holder, 9.5mm Pin | each |
| **75941-16H** | Variable Size Geological Thin Section Holder, Hitachi M4 | each |

## Dual Geological Thin Section Holder

**75941-18**

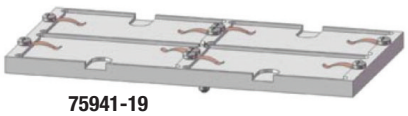


**75941-18H**

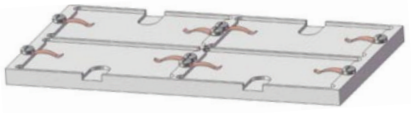
This thin section holder made from aluminum with copper clips and brass screws. The unit measures 55 x 58 x 8mm and it holds two standard geological thin sections or slides of 47 x 27mm. The holder has convenient tweezer inserts which allow for easy loading. Tweezer inserts enable easy loading. Clips are provided for secure holding.

| | | |
|---|---|---|
| **75941-18** | Dual Geological Thin Section Holder, 9.5mm Pin | each |
| **75941-18H** | Dual Geological Thin Section Holder, Hitachi M4 | each |

## Quadruple Geological Thin Section Holder



**75941-19**



**75941-19H**

This thin section holder made from aluminum with copper clips and brass screws. The unit measures 107 x 58 x 8mm and it holds four standard geological thin sections or slides of 47 x 27mm. The holder has convenient tweezer inserts which allow for easy loading. Tweezer inserts enable easy loading. Clips are provided for secure holding.

| | | |
|---|---|---|
| **75941-19** | Quadruple Geological Thin Section Holder, 8.5mm Pin | each |
| **75941-19H** | Quadruple Geological Thin Section Holder, Hitachi M4 | each |

# SEM SUPPLIES

## Specimen Holders (continued) / FIB HOLDERS

### Small FIB Grid Holder

Holds up to 2 FIB grids of the same thickness. Handy FIB grid holder on a standard 12.7mm (1/2") pin stub. Can also be used to safely store FIB grids with thin sections attached. Includes Philips screwdriver #0.

| | |
|---|---|
| **Overall Dimensions** | 12.7mm (1/2") x 7.8mm (0.3mm) H w/o pin. |
| **Pin** | Standard 3.2mm (1/8"). |
| **Material** | Vacuum grade aluminum with brass screw. |

| Cat. # | Description | Qty |
|---|---|---|
| **75950-02** | Small FIB Grid Holder, 12.7mm, Pin | each |

### Single 1/2" FIB Sample and Grid Holder

Holds a FIB sample mounted on standard 1/2" (12.7mm) pin stub for FIB milling and lift-out procedures. Conveniently holds two FIB grids close to the sample to mount prepared TEM lamellae on the FIB grid for TEM imaging. Cost-effective holder suitable for all FIB/SEM systems which accept pin mount holders, including the FEI, ZEISS and Tescan systems. For the JEOL and Hitachi systems, use a pin mount adapter. *Includes Philips screwdriver #0.*

| | |
|---|---|
| **Overall Dimensions** | 22.4 x 12.7 x 11.7mm (0.88" x 0.5" x 0.46"). |
| **Pin** | Standard 3.2mm (1/8"). |
| **Material** | Vacuum grade aluminum with brass screw. |

| Cat. # | Description | Qty |
|---|---|---|
| **75950-03** | Single 1/2" FIB Sample and Grid Holder, Pin | each |

### Double 1/2" FIB Sample and Grid Holder

Holds FIB samples mounted on two standard 1/2" (12.7mm) pin stubs for FIB milling and lift-out procedures. Conveniently holds two FIB grids close to the sample to mount prepared TEM lamellae on the FIB grid for TEM imaging. Cost-effective holder suitable for all FIB/SEM systems which accept pin mount holders, including the FEI, ZEISS and Tescan systems. For the JEOL and Hitachi systems, use a pin mount adapter. *Includes Philips screwdriver #0.*

| | |
|---|---|
| **Overall Dimensions** | 36.5 x 12.7 x 11.6mm (1.44" x 0.5" x 0.46"). |
| **Pin** | Standard 3.2mm (1/8"). |
| **Material** | Vacuum grade aluminum with brass screw. |

| Cat. # | Description | Qty |
|---|---|---|
| **75950-04** | Double 1/2" FIB Sample and Grid Holder, Pin | each |

### Multiple FIB Grid Holder

Larger size enables this FIB grid holder to handle multiple FIB grids of the same thickness. Can also be used to safely store FIB grids with thin section (lamellae) attached. Convenient brass thumbscrews make loading and unloading easy.

| | |
|---|---|
| **Overall Dimensions** | 22.5 x 29 x 13.5mm (7/8" x 1-1/8" x 5/8"). |
| **Pin** | Standard 3.2mm (1/8"). |
| **Material** | Vacuum grade aluminum with brass screw. |

| Cat. # | Description | Qty |
|---|---|---|
| **75950-05** | Multiple FIB Grid Holder | each |

### 1" FIB Sample and Grid Holder

Holds an FIB sample mounted on a standard 25mm (1") pin stub for FIB milling and lift out procedures. Can also be used to hold FIB grids of the same thickness to mount the prepared lamellae on an FIB grid for TEM imaging. This cost-effective and versatile holder is suitable for all FIB/SEM systems which accept pin mount holders, including the FEI, ZEISS and Tescan systems. For the JEOL and Hitachi systems, use a pin mount adapter. Convenient brass thumbscrews make loading and unloading easy.

| | |
|---|---|
| **Overall Dimensions** | 50 x 29 x 13.5mm (2" x 1-1/8" x 5/8"). |
| **Pin** | Standard 3.2mm (1/8"). |
| **Material** | Vacuum grade aluminum with brass screw. |

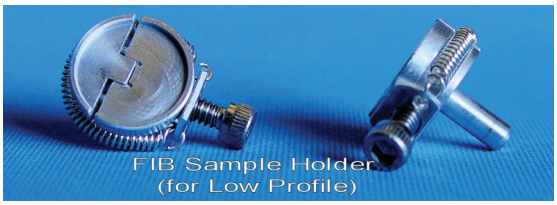
| Cat. # | Description | Qty |
|---|---|---|
| **75950-06** | 1" FIB Sample and Grid Holder, Pin | each |

### FIB Sample Holders

*Fortress™ FIB Holder with CastleGuard™ Protection*

Fortress™ FIB Holders are reusable holders that secure FIB sample that are held in a specific orientation without the use of adhesives, adhesive tabs, or conductive paints. Fortress™ FIB Holders can be used to position a thin, whole or cut TEM grid/disk in an orientation such that either in-situ or an ex-situ. FIB lift-out technique can be used to attach a FIB-prepared sample. Physical protection of the mounted sample on the grid is provided with the CastleGuard™ protection design. Up to 30 Fortress FIB Holders can be stored in a single SS200 Sample Saver™ storage container.

- **Unique clamping mechanism secures sample without over tightening**
- **Standard ⅛" pin mount fits most FIBs and SEMs**
- **Peripheral support structure protects specimens during handling and transport**
- **Economical design enables user to prepare and store samples on the same holder**
- **Compatible with Sample Saver™ Storage containers for secure storage and transport in an inert environment**



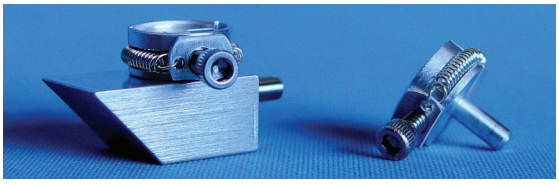

### Fortress™ FIB Holder – Low Profile

Low Profile Fortress™ FIB Holder to hold either a standard FIB lift out specimen on a grid or an H-Bar cut Sample.

### Fortress™ Sample Loader

Securely holds the Fortress™ Low Profile holder under a stereomicroscope and permits viewing from 2 angles without changing focus on the microscope.

| Cat. # | Description | Qty. |
|---|---|---|
| **75956-01** | FIB sample Holder for Low Profile | each |
| **75956-50** | Fortress™ Sample Loader for Low Profile | each |



### Fortress™ FIB Holder – High Profile

High Profile Fortress™ FIB Holder to hold a standard FIB lift-out specimen on a grid.

### Fortress™ Sample Loader

Securely holds the Fortress™ High Profile holder under a stereomicroscope and permits viewing from 2 angles without changing focus on the microscope.

| Cat. # | Description | Qty. |
|---|---|---|
| **75957-01** | FIB sample Holder – High Profile | each |
| **75957-50** | Fortress™ Sample Loader for High Profile | each |



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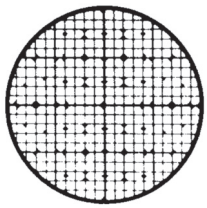
## Special Grids for SEM

Finder grids for SEM; a valuable tool for analytical studies. The grids are available in 10mm diameter and they can be placed directly on the stub surface and used to identify the area of interest in which the studies are performed.

| | | |
|---|---|---|
| **80100-Cu** | SEM, Finder Grids, Copper | 25/vial |



## SEM Finder Grids

These new SEM grids are designed to aid in the identification and localization of SEM specimens when placed on standard SEM stubs.

### Type SEMF1

The SEMF1 has several features that are incorporated for easier location of the specimen and identification of areas of special interest

- **Referring to the annular rim identifies north, south, east and west.**
- **The four quadrant markers are tapered towards the center.**
- **100 Radial sectors are easily identified by reference to decimal numbers in the annular rim and alphabet letters in the four quadrants.**
- **A matt surface on one side is for correct positioning – matt side up.**

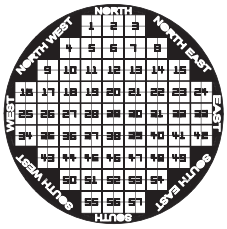
| | |
|---|---|
| **Overall Diameter:** | 10 mm |
| **Overall Thickness:** | ~50 µm |
| **Material:** | Copper, Nickel or Gold |

| Cat. # | Description | Qty. |
|---|---|---|
| **80103-Cu** | SEMF3, Copper | 10/vial |
| **80103-Ni** | SEMF3, Nickel | 10/vial |
| **80103-Au** | SEMF3, Gold | 5/vial |

### Type SEMF2

The SEMF2 allows for easy characterization and analysis of particles and suspensions.

The larger cells are identified using numbers from 1 – 57. Each large cell is sub-divided into 4, making a total of 228 identifiable cells by reference to their number and geographical location.



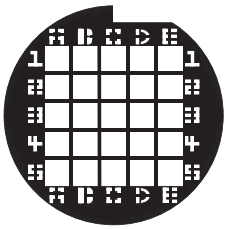
| | |
|---|---|
| **Overall Diameter:** | 10 mm |
| **Overall Thickness:** | ~50 µm |
| **Material:** | Copper, Nickel or Gold |

| Cat. # | Description | Qty. |
|---|---|---|
| **80103-Cu** | SEMF3, Copper | 10/vial |
| **80103-Ni** | SEMF3, Nickel | 10/vial |
| **80103-Au** | SEMF3, Gold | 5/vial |

### Type SEMF3

The SEMF3 uses an alpha-numeric index, allowing up to 25 predetermined specimens to be fixed and then located in a SEM.

25 cells are identified by reference to their alpha-numeric position. The large asymmetric cut-out feature in the rim enables the right view to be easily obtained when placing on a SEM stub.



| | |
|---|---|
| **Overall Diameter:** | 10 mm |
| **Overall Thickness:** | ~50 µm |
| **Material:** | Copper, Nickel or Gold |

| Cat. # | Description | Qty. |
|---|---|---|
| **80103-Cu** | SEMF3, Copper | 10/vial |
| **80103-Ni** | SEMF3, Nickel | 10/vial |
| **80103-Au** | SEMF3, Gold | 5/vial |

## RELATED PRODUCTS...

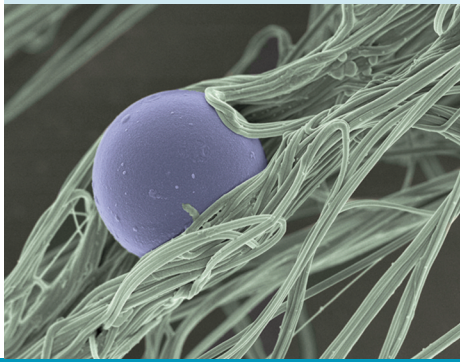
The **NEW** EMS Plus Series of Sputter Coaters & Evaporators


The EMS Plus Series is the latest version of our internationally acclaimed, market-leading range of coaters, which offer sputter and evaporation coating combined in one easy to use platform.

They are increasingly used in high-resolution microscopy, where ultra-fine coating is a must.

The Plus Series provides users with a versatile, effective and affordable choice of rotary or turbomolecular pumped coaters.

**See pages 174-195.**



# SEM SUPPLIES

## SEM for Forensics

### Forensic Gunshot Residue Field Kits

Our comprehensive line of high-quality GSR field sampling kits includes certified SEM pin stubs with double-coated adhesive carbon tabs in plastic tubes. The certified SEM pin stubs have very low amounts of Pb, Sb and Ba, not detectable by SEM/EDX. The caps securely hold the GSR sample disc for easy GSR collection. Pre-labeled discs and tubes are both ready-for-sampling. A sturdy, sealed tamper evident transport box is also included.

**Kit contents:**

- **Certified SEM pin mounts with adhesive carbon discs in pre-labeled tubes**
- **Powder-free nitrile gloves**
- **Evidence label**
- **Chain of custody label on box**
- **Tamper-evident cardboard transport box (4-1/2"W x 3-3/4"D x 3"H)**
- **Tamper evident seal**
- **Instruction sheet**

**Product Details**

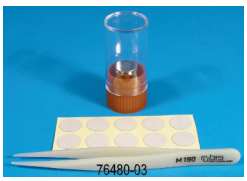
**3-Disc GSR Field Kit,** with two sampling discs plus a control disc to enhance certainty of the analysis.

**4-Disc GSR Field Kit,** is useful for sampling palm and back separately on both hands.

**5-Disc GSR Field Kit,** is compatible with FBI requirements, with four discs plus a control disc.

| Cat. # | Description | Qty. |
|---|---|---|
| **76480-11** | 3 Disc Forensic Gunshot Residue Field Kit | kit |
| **76480-13** | 4 Disc Forensic Gunshot Residue Field Kit | kit |
| **76480-15** | 5 Disc Forensic Gunshot Residue Field Kit | kit |

### Forensic Collection Kit




These kits are suitable for field work and gunshot residue in the lab or out. Manufactured from a special – certified aluminum alloy, containing only trace amounts of Barium (~0.00010%), Copper (~0.0139%), Zinc (~0.0094%), Nickel (~0.00309%, and Antimony (~0.00080%). These sample mounts are suitable for typical forensic sample studies. The kit consists of 10 pin mounts (12.74mm diameter) 10 carbon adhesive tabs, 10 storage vials, and one plastic tweezer. Two styles of glass vials are available as well as one in plastic.

| Cat. # | Description | Pack |
|---|---|---|
| **76480-01** | Kit with Glass Shell Vial, size 23.7mm Dia x 37mmH | kit |
| **76480-02** | Kit with Glass Shell Vial, size 23.5mm Dia x 74mmH | kit |
| **76480-03** | Kit with Plastic Vial, size 23.5mm Dia x 52.5mmH | kit |

### Numbered Gunshot Residue Sampler

Numbered, certified aluminum mount with a double-coated adhesive carbon tab applied to secure the sample in a clean, glass vial 25mm OD x 55mm high (1" x 2.17"). Packaged in a box of 100. Numbers can be specified as 100 consecutive numbers between 0 and 9999 (greatest numbers). Please inform customer service about the numbering sequence when ordering this product.

| Cat. # | Description | Qty. |
|---|---|---|
| **76480-16** | Numbered Gunshot Residue Sampler | 100/pk |

### Forensic Gunshot Residue Lab Kit

Includes ten 12.7mm SEM pin mounts in clean, glass storage tubes (25mm OD x 55mm high) secured in a compact transport box with labels. This Kit is designed to avoid any contamination of GSR samples. Choose from either standard 12.7mm pin mounts with 8mm pins or with shorter 6mm pins. Also available as a sample kit without mounts and tabs.

| Cat. # | Description | Qty. |
|---|---|---|
| **76480-18** | **Forensic Gunshot Residue Lab Kit:** *10 each 12.7mm SEM pin mounts (8mm pin), with mounted carbon tabs (12mm; 0.47 dia.) in capped glass tubes, 12 blank labels* | kit |
| **76480-19** | **Forensic Gunshot Residue Lab Kit:** *10 each 12.7mm SEM short pin mounts (6mm pin for ZEISS/LEO), with mounted carbon tabs (12mm; 0.47 dia.) in capped glass tubes, 12 blank labels* | kit |

**Sample Kit without pin mounts and tabs:**

| | | |
|---|---|---|
| **76480-22** | **Forensic Sample Kit:** *10 capped glass sample tubes, 12 blank labels* | kit |

### Forensic Field Sampler

Glass specimen vial (25mm OD x 55mm high) with a high-purity certified 12.7mm SEM pin stub specimen mount (see below), both with and without an adhesive carbon conductive tab, mounted into the plastic cap. Our Forensic Field Sampler has been designed to collect forensic evidence with minimum interference and/or contamination from the sampler. Three versions are available: without adhesive carbon tab, with ready-to-use adhesive carbon tab, or with covered carbon tab (plastic cover needs to be removed prior to use). Choice of standard 12.7mm SEM pin mount with 8mm pin or 12.7mm SEM pin mount with shorter 6mm pin (ZEISS/LEO)

**Investigation Applications for SEM or Light Microscopy:**

- **Gunshot residue (GSR)**
- **Powder samples**
- **Fiber samples**
- **Paint chips**
- **Particle sampling**
- **Glass fragments**

Ideal for SEM specimen preparation on the most frequently used SEM pin stubs, facilitating easy carbon coating for SEM/EDX investigation.

The Forensic Field Sampler can be securely stored in the glass specimen vial and easily shipped with the cap holding the sampler stub in place. Adhesive carbon tabs secure the evidence material.

| Cat. # | Description | Qty. |
|---|---|---|
| **76480-31** | Forensic Field Sampler without Adhesive Carbon Tab | 100/pk |
| **76480-32** | Forensic Field Sampler with Adhesive Carbon Tab, ready to use | 100/pk |
| **76480-33** | Forensic Field Sampler with Adhesive Carbon Tab, and clear plastic cover | 100/pk |
| **76480-34** | Forensic Field Sampler without Adhesive Carbon Tab, Short Pin | 100/pk |
| **76480-35** | Forensic Field Sampler with Adhesive Carbon Tab, ready to use, Short Pin | 100/pk |
| **76480-36** | Forensic Field Sampler with Adhesive Carbon Tab, and clear plastic cover, Short Pin | 100/pk |

### For more SEM Single Mount Storage Tubes...

See page 57



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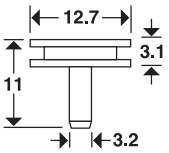
Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

## SEM For Forensics (continued)

### Forensic Certified Mounts




This mount is made from a special certified Aluminum alloy which does not contain any of the objectionable elements that may interfere with samples collected for GSR . These mounts are available with an 8mm pin, or 6mm pin.

| Cat. # | Description | Qty. |
|---|---|---|
| **76475-05** | Forensic Certified Mount, with 8mm Pin | 10/pk |
| **76475-10** | Forensic Certified Mount, with 8mm Pin | 100/pk |
| **76475-50** | Forensic Certified Mount, with 8mm Pin | 500/pk |
| **76475-52** | Forensic Certified Mount, with 6mm Pin | 10/pk |
| **76475-53** | Forensic Certified Mount, with 6mm Pin | 100/pk |
| **76475-54** | Forensic Certified Mount, with 6mm Pin | 500/pk |

### Circular Cover Glass – GOLD SEAL®

GOLD SEAL® cover glass is made from pre-selected, pre-cleaned silicate glass. It is packaged with desiccants in a lint free box. Both cover glass cases and slide boxes convert to convenient slide storage files.

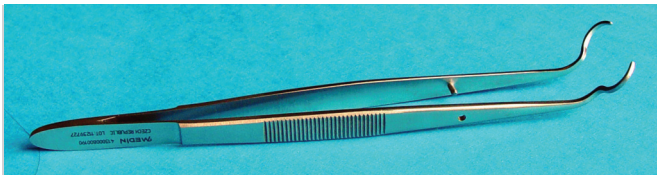
| Cat. # | Dia. | Thickness | Pieces/oz | Pack |
|---|---|---|---|---|
| **72231-01** | 12 mm | #1 (.13-.17 mm) | 692 | 1 oz. |
| **72231-10** | 12 mm | #1 (.13-.17 mm) | 692 | 10 oz. |
| **72228-01** | 15 mm | #1 (.13-.17 mm) | 443 | 1 oz. |
| **72228-10** | 15 mm | #1 (.13-.17 mm) | 443 | 10 oz. |
| **72229-01** | 18 mm | #1 (.13-.17 mm) | 308 | 1 oz. |
| **72229-10** | 18 mm | #1 (.13-.17 mm) | 308 | 10 oz. |
| **72221-01** | 22 mm | #1 (.13-.17 mm) | 206 | 1 oz. |
| **72221-10** | 22 mm | #1 (.13-.17 mm) | 206 | 10 oz. |
| **72223-01** | 25 mm | #1 (.13-.17 mm) | 159 | 1 oz. |
| **72223-10** | 25 mm | #1 (.13-.17 mm) | 159 | 10 oz. |
| **72230-01** | 12 mm | #1½ (.16-.19 mm) | 597 | 1 oz. |
| **72230-10** | 12 mm | #1½ (.16-.19 mm) | 597 | 10 oz. |
| **72222-01** | 18 mm | #1½ (.16-.19 mm) | 266 | 1 oz. |
| **72222-10** | 18 mm | #1½ (.16-.19 mm) | 266 | 10 oz.t |
| **72224-01** | 22 mm | #1½ (.16-.19 mm) | 178 | 1 oz. |
| **72224-10** | 22 mm | #1½ (.16-.19 mm) | 178 | 10 oz. |
| **72225-01** | 25 mm | #1½ (.16-.19 mm) | 137 | 1 oz. |
| **72225-10** | 25 mm | #1½ (.16-.19 mm) | 137 | 10 oz. |

### Metal Specimen Discs for use with the Atomic Force Microscope

These are high quality metal discs with smooth edges and flat surfaces for use in Atomic force Microscopy.

| Cat. # | Description | Qty |
|---|---|---|
| **75010-10** | 10 mm Specimen Metal Discs for AFM | 50/pk |
| **75010-12** | 12 mm Specimen Metal Discs for AFM | 50/pk |
| **75010-15** | 15 mm Specimen Metal Discs for AFM | 50/pk |
| **75010-20** | 20 mm Specimen Metal Discs for AFM | 50/pk |

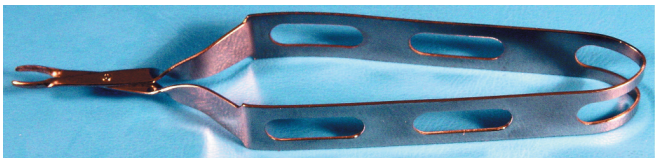
### SEM Mount Forceps



Made from stainless steel with a serrated handle and a guide pin. The tip is bent at a 45 degree and formed into a ring, which has a diameter of 10mm when fully closed. 150mm long.

| | | |
|---|---|---|
| **76805** | SEM Mount Forceps | each |

### Unique Uni-Band Gripper

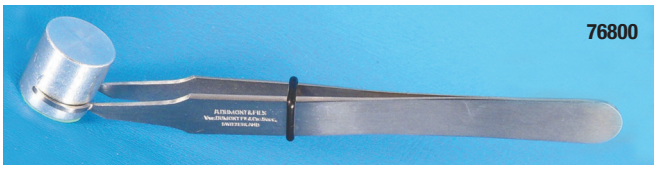


The Unique Uni-Band Gripper, made of 300 Series Memory Stainless Steel, is harder than titanium. Perfect gripper for handling specimen mount stubs.

| | | |
|---|---|---|
| **76806** | Unique Uni-Band Gripper | each |

### Gunshot Residue Tweezers

Dumont Gunshot Residue Tweezers, the finest tweezers available. Choose the one that best suits your needs.






**Polished Dumoxel Antimagnetic Steel**

| Cat. # | Description | Qty. |
|---|---|---|
| **76800-GS** | Gunshot Residue Tweezers 2E½ (0=12.7mm) | each |
| **76802-GS** | Gunshot Residue Tweezers 2E¼ (0=6.4mm) | each |
| **76804-GS** | Gunshot Residue Tweezers 2E⅛ (0=3.2mm) | each |

# SEM SUPPLIES

## SEM For Forensics (continued)

# III Mica Sheets and Disks

*The Highest Quality (V-1 or V-2) for AFM Applications to the Medium Quality (V4 to V-6) for Replication, Thin Film Deposition*

### Introduction

EMS Mica Sheets offer a clean surface for E.M. applications, carbon filming and particle spraying, as well as for AFM applications.

There are two types of mica: muscovite and phlogopite. Generally, one differs from the other by color (Muscovite is Ruby, Green or White; Phlogopite is Amber, Yellow, or Silver) The maximum operating temperature for Muscovite is about 500 – 600˚C and for Phlogopite is about 800 – 900˚C.

Our line consists of High Quality Muscovite Mica. This mica peels off very thin up to 0.0001" uniform layers, exposing "virgin" mica upon splitting.

### Characteristics:

Muscovite, potash type mica, sometimes known as granitic mica, is the best of all micas in dielectric strength, perfection of cleavage, and transparency.

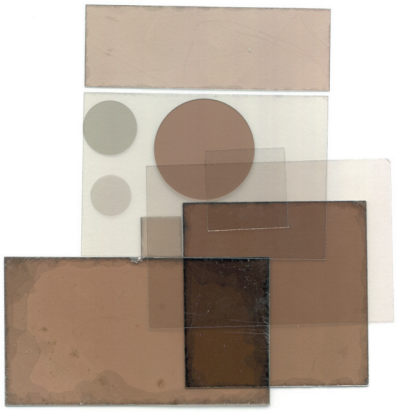
It has the following chemical formula: $H_2KAl_3(SiO_4)_3$.

### Chemical Composition:

Silica .....45.5%
Alumina .....37.5%
Potash .....12.0%
Water .....5.0%

It has a vitreous luster and is colorless to gray, brown, pale green, violet, dark olive green, or rose red. It may be transparent to translucent. It has strong double refraction and is optically negative. It loses water of constitution at 600˚C and is practically non-magnetic. It exhibits pleochrism, which is the property of varying in color when viewed from different angles.

RUBY muscovite is harder than green and has a pale brownish red color in thin sheets (0.020") or ruby red in thick plates (0.4"). Ruby mica can be split easily into films of 0.001" or thinner because it has such excellent cleavage. In other colors, this thinness can be obtained but at a considerable risk of cracking.



### Quality Determination:

The quality of muscovite mica is verbal determination by visual quality classification ASTM (D351-57T) from the best V-1 to the worst is V-10A.

1. **V i-1: Clear.** – Hard, of uniform color, nearly flat, free of all stains, foreign inclusion, cracks, and other similar defects.
2. **V-2: Clear and slightly stained.** – Hard of uniform color, nearly flat and may contain slight crystallographic discoloration, and very slight air inclusions and not more than one fourth of the usable area.
3. **V-3: Fair stained.** – Hard, of uniform color, may contain slight waves, slight crystallographic discoloration, and slight air inclusions and not more than one-haft of the usable area.
4. **V-4: Good Stained.** – Hard, of uniform color, may contain medium waves, slight crystallographic discoloration, and medium air inclusion in not more than two-third of the usable area.
5. **V-5: Stained A Quality.** – Hard, may contain medium air inclusions, uniformly distributed in the usable area; slight green vegetable stains, medium waviness, and heavy waves if specified.
6. **V-6: Stained B Quality.** – Hard, may contain heavy air inclusions and heavy waves, medium green vegetable stains, slight black and red dots (mineral), and clay stain.
7. **V-7: Heavy stained.** – Hard, and may contain heavy air inclusions and waves, slight light black and red dots (mineral) medium cloudy stains, clay stains and green stains (vegetable). Soft, buckles, ridges, and sand blast acceptable if specified.
8. **V-7A: Densely Stained.** – Hard and soft. May contain heavy waves and air inclusions, cloudy stains. High black and red dots (mineral). Medium black and red stained (mineral), buckles, and ridges. Also green stain (vegetable type), clay stains, herringbones, and sand blast.
9. **V-8: Black dotted.** – Hard, may contain medium waves, heavy air inclusions, cloudy stains, light black and red dots (mineral), and green stains (vegetable).
10. **V-9: Black spotted.** – Hard, may contain medium waves, heavy air inclusions, cloudy stains, light black and red dots (mineral), and green stains (vegetable type), slight black stains (mineral), and sand blast.
11. **V-10: Black Stained.** – Hard, may contain medium waves, heavy air inclusions, cloudy stains, light black and red dots (mineral), green stains (vegetable type), and sand blast, medium black stains (mineral), slight red stains (mineral), and clay stains.
12. **10A: Densely Black and Red Stained.** – Hard and may contain heavy waves, air inclusions, cloudy stains, light black and red dots (mineral), red stains (mineral), black and red stains (mineral), green stains (vegetable type), and sand blast, very dense black and red stains (mineral), and slight clay stains. Soft if specified

### Applications:

In general, for those whom are using mica for the making of carbon support films, thin films

### Physical Properties:

| | |
|---|---|
| **Hardness: Moh's scale:** | 2.8 – 3.2 |
| **Shore's Test** | 80 – 150 |
| **Specific Gravity,** g/cm$^3$ | 2.6 – 3.2 |
| **Tensile Strength,** kg/cm$^2$ | ~ 1750 |
| **Compression Strength,** kg/cm$^2$ | 1900 – 2850 |
| **Refractive Index** (air=1) | 1.56 – 1.60/61 |
| **Dielectric Strength** @20˚C in volt/mil | 3,000 – 6,000 |
| **Max. Thermal Resistance** | 625ºC (1,157ºF) |
| **Modulus of Elasticity,** kgf/cm$^2$x10$^{-3}$ | 1400 – 2100 |
| **Optic Axial Angle** | 50º – 75º |
| **Coefficient of Expansion** per ˚C | Perpendicular to cleavage plane 9 x10$^{-4}$ – 36 x10$^{-4}$ |
| **Calcining Temperature** | 700 – 800ºC |
| **Thermal Conductivity,** gm.cal/sec/cm$^2$/ºC/cm | ~0.0013 (Perpendicular to cleavage plane) |
| **Water of Constitution,** % | 4 – 5 |
| **Moisture Absorption** | Very low |
| **Apparent Electric Strength** (0.001-0.003" thick) | 120 – 200 kV/mm |
| **Permittivity** @ 15ºC (60ºF) | 6 – 7 |
| **Power Factor** (loss Tangent) @15ºC | 0.0001 – 0.0004 |
| **Volume Resistively** @25ºC (77ºF), Ohm.cm | 4x10$^{-15}$ – 2x10$^{-17}$ |
| **Acid Reaction** | Affected by HF |



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## Mica Sheets and Disks (continued)

coatings research, and some AFM studies where HOPG are used to taking place, the mica V-4 or V-5 is recommended. (Mica must always use freshly cleaved surfaces).

For AFM and SPM calibration, V-1 or V-2 is recommended.

However, we believe that it is important that you know what kind of mica is being used in your lab. The information on the mica is given above should be used to make your choice.

Here at EMS we try to stock a variety of sizes with different thicknesses and classifications of quality for convenience.

### Ordering Information

**Muscovite Mica V-1 Quality:**

| Cat.# | Mica Size | Quality | Thickness (mm) | Pack |
|---|---|---|---|---|
| 71855-01 | 50 x 75mm | V-1 | 0.15 – 0.21 | each |
| 71855-01-10 | | | | 10/pk |
| 71855-05 | 25 x 75 mm | V-1 | 0.26 – 0.31 | each |
| 71855-05-10 | | | | 10/pk |
| 71855-10 | 25 x 25 mm | V-1 | 0.15 – 0.21 | each |
| 71855-10-10 | | | | 10/pk |
| 71855-11 | 25 x 25 mm | V-1 | 0.26 – 0.31 | each |
| 71855-11-10 | | | | 10/pk |
| 71855-15 | 15 x 15 mm | V-1 | 0.15 – 0.21 | each |
| 71855-15-10 | | | | 10/pk |
| 71856-01 | 9.5 mm Diameter | V-1 | 0.15 – 0.21 | each |
| 71855-01-10 | | | | 10/pk |
| 71856-02 | 12 mm Diameter | V-1 | 0.15 – 0.21 | 10/pk |
| 71856-03 | 15 mm Diameter | V-1 | 0.15 – 0.21 | 10/pk |
| 71856-04 | 20 mm Diameter | V-1 | 0.15 – 0.21 | 10/pk |

**Muscovite Mica V2 Quality:**

| Cat.# | Mica Size | Quality | Thickness (mm) | Pack |
|---|---|---|---|---|
| 71857-01 | 50 x 75mm | V-2 | 0.15 – 0.21 | each |
| 71857-01-10 | | | | 10/pk |
| 71857-05 | 25 x 75 mm | V-2 | 0.26 – 0.31 | each |
| 71857-05-10 | | | | 10/pk |
| 71857-10 | 25 x 25 mm | V-2 | 0.15 – 0.21 | each |
| 71857-10-10 | | | | 10/pk |
| 71857-11 | 25 x 25 mm | V-2 | 0.26 – 0.31 | each |
| 71857-11-10 | | | | 10/pk |
| 71857-15 | 15 x 15 mm | V-2 | 0.15 – 0.21 | each |
| 71857-15-10 | | | | 10/pk |
| 71858-01 | 9.5 mm Diameter | V-2 | 0.15 – 0.21 | each |
| 71858-01-10 | | | | 10/pk |

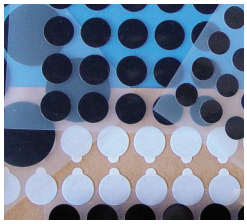
**Muscovite Mica V4 Quality:**

| Cat.# | Mica Size | Quality | Thickness (mm) | Pack |
|---|---|---|---|---|
| 71853-01 | 50mm x 75 mm | V-4 | 0.15 – 0.21 | 10/pk |
| 71853-05 | 25mm x 75mm | V-4 | 0.26 – 0.31 | 10/pk |
| 71853-10 | 25mm x 25mm | V-4 | 0.15 – 0.21 | 10/pk |
| 71853-11 | 25mm x 25mm | V-4 | 0.26 – 0.31 | 10/pk |
| 71853-15 | 15mm x 15mm | V-4 | 0.15 – 0.21 | 10/pk |
| 71854-01 | 9.5mm Diameter | V-4 | 0.15 – 0.21 | 10/pk |
| 71854-15 | 12.7mm Diameter | V-4 | 0.15 – 0.21 | 10/pk |

**Muscovite Mica V5 Quality:**

| Cat.# | Mica Size | Quality | Thickness (mm) | Pack |
|---|---|---|---|---|
| 71850-01 | 50mm x 75 mm | V-5 | 0.15 – 0.21 | 10/pk |
| 71851-05 | 25mm x 75mm | V-5 | 0.26 – 0.31 | 10/pk |
| 71850-10 | 25mm x 25mm | V-5 | 0.15 – 0.21 | 10/pk |
| 71850-11 | 25mm x 25mm | V-5 | 0.26 – 0.31 | 10/pk |
| 71850-15 | 15mm x 15mm | V-5 | 0.15 – 0.21 | 10/pk |
| 71852-01 | 9.5mm Diameter | V-5 | 0.15 – 0.21 | 10/pk |

## Conductive Carbon Adhesive Tabs



**Standard Carbon Conductive Adhesive Tabs** – Tabs are formed by two sides of thick conductive adhesive (45 µm on each side) with the center conductive core film (35 µm). With the total thickness of 125 µm, these tabs will offer reasonably firm, smooth surfaces for a variety SEM applications, including gunshot residue analysis. Tabs are protected by white liners, which do not have to be removed when samples are ready to be mounted.

- **No out-gassing**
- **Conductive adhesive is carbon filled acrylic glue**
- **Solvent free**
- **Adhesive can be removed by ethyl acetate, ethanol, isopropyl alcohol or alcohols**
- **Service temperature is up to 60ºC (140ºF)**

Tabs contain some traces of Si, Sb, S, Fe, Mg, Na.

**Thick Carbon Conductive Tabs or Image Tabs** – The stiff and smooth surface conductive tabs are 260 µm thick, including 200 µm thick conductive carbonate base, coated 30 µm thick on each side with conductive adhesive. However, these tabs are not as conductive and sticky as the Standard Carbon Conductive Tabs. Thick Carbon Conductive Tabs are used for photographic background as well as for Jet Scan applications, where the tabs must be removed and filed away.

**Ultra-Thin Carbon Conductive Adhesive Tabs** – These tabs have Core material which is nonconductive cloth (70 µm) with Carbon Filler Conductive Adhesive (2 x 45µm). Total thickness is 160 µm.

**Spectro Grade Carbon Adhesive Tabs** – High purity conductive carbons for less interference signals, such as X-Ray analysis.

**Ultra-Smooth Carbon Adhesive Tabs** – Carbon adhesive tabs that eliminate issues with rough surfaces, insufficient tackiness, and hardness with significantly lower contaminant levels under EDS. Tabs are made in USA and very popular, and may be used in place of other conductive adhesive in many applications in conventional and field emission microscopes. They are also widely used in forensic laboratories for study of gunshots residues. Without the addition of conductive coating, small nonconductive particles can often be imaged and X-Ray analyzed, cutting down your analysis time. These tabs are composed of a thin film of strong adhesive approximately ½" diameter. Over 99% transparent to EDS, with a very small amount of nickel (0.6%) and copper (< 0.3%).

Refrigeration will increase shelf life but tabs need to be warmed up to room temperature before use (usually more than one hour)

| Cat. # | Description | Qty. |
|---|---|---|
| 77825-06 | Standard Carbon Adhesive Tabs, 6mm Dia. | 100/pk. |
| 77825-09 | Standard Carbon Adhesive Tabs, 9mm Dia. | 98/pk. |
| 77825-12 | Standard Carbon Adhesive Tabs, 12mm Dia. | 100/pk. |
| 77825-25 | Standard Carbon Adhesive Tabs, 25mm Dia. | 54/pk. |
| 77824-12 | Thick Carbon Conductive Tabs, 12mm Dia. | 100/pk. |
| 77825-12-SP | Ultra Thin Carbon Adhesive Tabs, 12mm Dia. | 200/pk. |
| 77826-12 | Spectro Grade Carbon Adhesive Tabs, 12mm Dia. | 120/pk. |
| 77827-12 | Ultra-Smooth Carbon Adhesive Tabs, 12mm | 100/pk. |
| 77827-25 | Ultra-Smooth Carbon Adhesive Tabs, 25mm | 50/pk. |

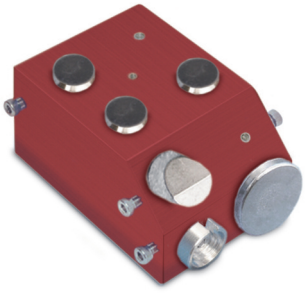
# SEM SUPPLIES

## Sample Preparation Stations

### SEM Specimen Preparation Stand

Specimen mounts of different sizes are placed in the outer ring of the holder base. The center hole of the base will hold a bottle of conductive adhesive. One side of the base takes 10 of the ⅛" pin mounts; reverse side takes 10 of 10 to 15mm diameter mounts.

| | | |
|---|---|---|
| **76750** | ⅛" SEM Preparation Stand | each |



### SEM Specimen Prep-Stand; Multi-Angle

A SEM specimen preparation stand with the ability to hold pin mounts on a 450 angle as well as in a vertical and horizontal direction. The stand which is made from Aluminum comes complete with screws that are used to secure the mount during preparation. Both ½" (12.7mm) and 1"(25mm) mounts can be accommodated on the stand

Measurements: 2.75" ( 70mm) x 2" (50mm) x 1.6" (40mm)

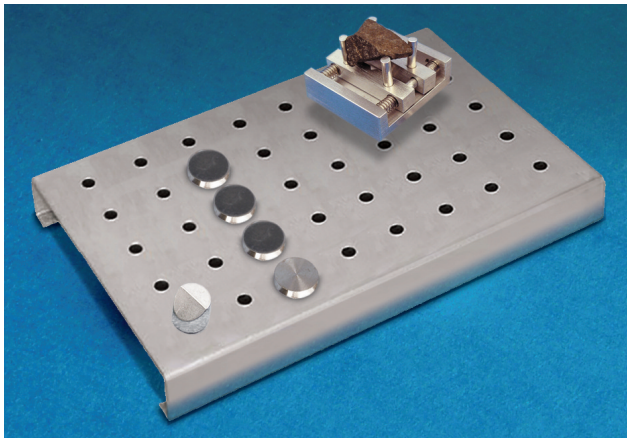
| | | |
|---|---|---|
| **75958-22** | SEM Specimen Prep-Stand; Multi-Angle | each |

### Prep-Stand: Pin Mounts

This stand is made from Aluminum and measures 2.4"(61mm) x 0.63" (16mm) and provides a stable surface for a variety of pin mounts.

| | | |
|---|---|---|
| **75958-23** | Prep-Stand; Pin Mount Style | each |

### Pin Mount Prep-Store Station



This stand is ideal for either storage and or specimen preparation of mounts. Made from Aluminum and has the capacity to hold up to 40 x ½ " (12.7mm) pin mounts or 12 of the 1" (25mm) mounts.

The Stand measures 5.39" (137mm) x 3.5" (89mm) x 0.63" (16mm).

| | | |
|---|---|---|
| **75958-24** | Pin Mount Prep-Store Station | each |

## Storage

### SampleSaver™

#### Portable Storage Containers

Our custom storage container for the storing and transporting of samples for SEM, TEM, FIB, AFM, etc. This device is different from a vacuum storage unit or from desiccators. The unit allows you to evacuate and backfill or purge with dry nitrogen. You can then pressurize the container to eliminate the possibility of diffusion into the container. It is ideal for shipping or storing sensitive samples from lab to lab.

| Cat. # | Description | Qty |
|---|---|---|
| **76540-01** | Small Portable Storage Container, SS100 | each |
| **76540-02** | Large Portable Storage Container, SS200 | each |

#### Sample Racks for the SS100 Sample Saver™

These sample racks are designed to fit into the SS100 Sample Saver™ for the storage of TEM grid boxes or aluminum stubs that needed to store in safe environment.

| Cat. # | Description | Qty |
|---|---|---|
| **76541-10** | Model SS100-TEM – TEM Grid Box Holder. Consists of 3 vented TEM grid boxes and storage rack to fit into SampleSaver™ SS100 | set |
| **76541-20** | Model SS100-125 – ⅛" SEM Stub Holder. Consists of 3 tiers sample rack. Each shelf holds 5 SEM stubs with ⅛" pin. (SEM stubs not included) | set |
| **76541-30** | Model SS100-375 – ⅜" SEM Stub Holder. Consists of 3 tiers sample rack. Each self holds 3 SEM stubs with ⅜" pin (SEM Stub not included) | set |
| **76541-40** | Model SS100-125-1 – ⅛" SEM Stub Holder. Consists of 3 tiers sample rack. Bottom shelf holds 1" dia sample mount and top two shelves each hold 5 SEM stubs with ⅛" pin (SEM stubs not included) | set |
| **76541-50** | Model SS100-375-1 – ⅜" SEM Stub Holder. Consists of 3 tiers sample rack. Bottom shelf holds 1" dia sample mount and two top shelves each hold 3 SEM stubs ⅜" pin (SEM stubs not included) | set |

#### Sample Racks for the SS200 Sample Saver™

These sample racks are designed to fit into the SS200 Sample Saver™ for the storage of TEM grid boxes or aluminum stubs that needed to store in safe environment.

| Cat. # | Description | Qty |
|---|---|---|
| **76542-00** | Model SS200-FIB – FIB Sample Holder to store SBT CastleGuard™ Holders (CastleGuard™ holders not included) | set |
| **76542-20** | Model SS200-125 – ⅛" SEM Stub Holder. Consists of 5 tiers sample rack. Each shelf holds 5 SEM stubs with ⅛" pin. (SEM stubs not included) | set |
| **76542-30** | Model SS200-375 – ⅜" SEM Stub Holder. Consists of 5 tiers sample rack. Each self holds 3 SEM stubs with ⅜" pin (SEM Stub not included) | set |
| **76542-40** | Model SS200-125-1 – ⅛" SEM Stub Holder. Consists of 5 tiers sample rack. Bottom shelf holds 1" dia sample mount and top four shelves each hold 5 SEM stubs with ⅛" pin (SEM stubs not included) | set |
| **76542-50** | Model SS200-375-1 – ⅜" SEM Stub Holder. Consists of 5 tiers sample rack. Bottom shelf holds 1" dia sample mount and four top shelves each hold 3 SEM stubs ⅜" pin (SEM stubs not included) | set |



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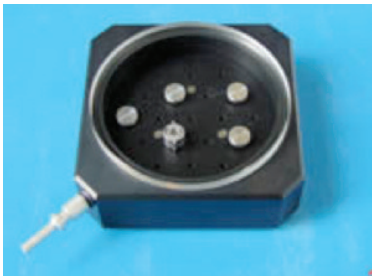
# SEM SUPPLIES

## Storage (continued)

### Sample Stub Vacuum Desiccator



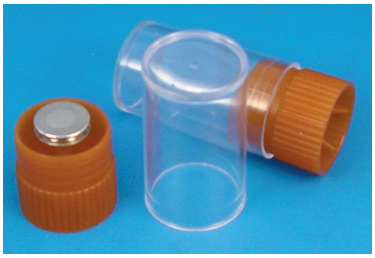
Precision machined from a block of aluminum – anodized black - this Sample Stub Vacuum Desiccator accommodates 18 SEM mount sample stubs, pin style, under vacuum.

- **Compact, sturdy, and long-lasting**
- **Prevents oxidation of sample during long term storage**
- **Pin stubs are kept secure inside the chamber by a built-in "O" ring in each position**
- **Very simple to use — required only a small vacuum pump to evacuate the chamber**
- **Clear acrylic top for easy viewing of contents**
- **Interlock when stacked together to save space**
- **Ideal for transport and storage of samples for SEM, TEM, FIB, AFM, etc.**

Measures: 13 cm x 13cm x 4.5cm High. Chamber cavity is 10.4cm diameter x 18mm deep. Lid is made of 10mm thick clear acrylic.

| Cat. # | Description | Qty |
|---|---|---|
| **76550** | SEM Stub Vacuum Desiccator | each |

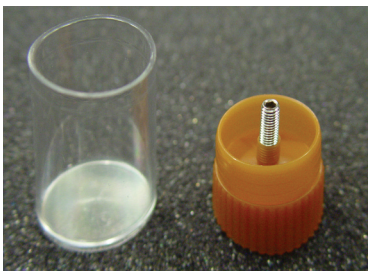
### SEM Single Mount Storage Tube



A plastic tube and plug. The pin mount ⅛" (3.1mm) in diameter is inserted securely to the plug and protected by the tube. Ideal for storage or mailing.

| Cat. # | Description | Qty |
|---|---|---|
| **76530-01** | SEM Single Mount Storage Tube | 10/pk |
| **76530-05** | SEM Single Mount Storage Tube | 50/pk |
| **76530-10** | SEM Single Mount Storage Tube | 100/pk |

### SEM Single Mount Storage Tube and Mailer, for Hitachi



A plastic tube and plug for M4 threaded Hitachi mounts. 15mm in diameter Tube. A 15 mm Hitachi mount can be inserted securely to the plug and then protected by the tube. Ideal for storage as well as mailing. The internal diameter of the tube is 0.83"(21mm). The Outer measurements of the tube are: 0.9" (23mm) x 2.05" H (52mm)

| Cat. # | Description | Qty |
|---|---|---|
| **76535-01** | SEM Hitachi Single Mount Storage Tube | 10/pk |
| **76531-05** | SEM Hitachi Single Mount Storage Tube | 50/pk |
| **76531-10** | SEM Hitachi Single Mount Storage Tube | 100/pk |

### SEM Paper Storage Box for Pin Mounts

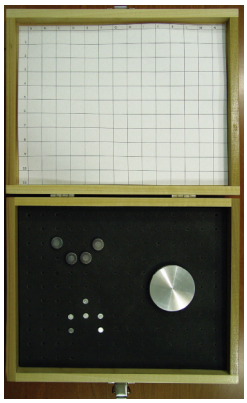
*An inexpensive solution for storing Pin Mounts*

With a Pop Up box which stores up to 8 mounts: ½" (12.7mm) head, ⅛" (3.2mm) diameter pin.

**Box Dimensions:**
7cm long x 3.8cm wide x 3.5cm high (2¾ x 1½ x 1⅜")

| Cat. # | Description | Qty |
|---|---|---|
| **76505** | SEM Paper Storage Box | 50/pk |

### Wooden Storage Box



EMS offers a high end wooden storage box for the storage of 12.7mm (½") pin mounts. The box can store up to 128 mounts in rubber foam with complete indexed sides)

| Cat. # | Description | Qty |
|---|---|---|
| **76507** | Wooden Storage Box for Pin Mounts | each |

### EMS 18 Pin Mount Storage Box and Holder

A unique storage box for pin mounts with 3.2mm (⅛") pins. The box is numbered 1-18 and it can accept mounts ranging in size from 6.4mm to 50 mm. With the ability to hold as follows: 18 of 12.7mm; 8 of 25mm; 2 of 32mm and even 38 or 50 mm. The maximum specimen height between mount surface and closed lid is 16mm (⅝").

| Cat. # | Description | Qty |
|---|---|---|
| **76506** | 18 Pin Mount Storage Box and Holder | each |

### EMS Specimen Storage Boxes for Hitachi Mounts

EMS introduces a unique box for Hitachi SEM mounts with M4 threaded hole in the base. The box is numbered 1 – 10 to accommodate Hitachi mounts from 15 to 32mm diameter. The box can hold the following:

- **10 x 15mm mounts**
- **8 x 25mm mounts**
- **2 x 32mm mounts**

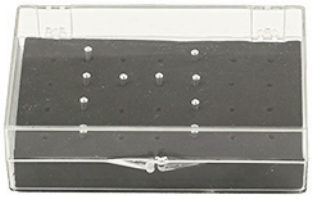
| Cat. # | Description | Qty |
|---|---|---|
| **76503** | EMS-Hitachi SEM Mount Box | each |
| **76504** | EMS-Hitachi SEM Mount Box | 10/pk |

# SEM SUPPLIES

## Storage (continued)

### IIz Storage Box for Gatan 3View® Pin Stubs

NEW

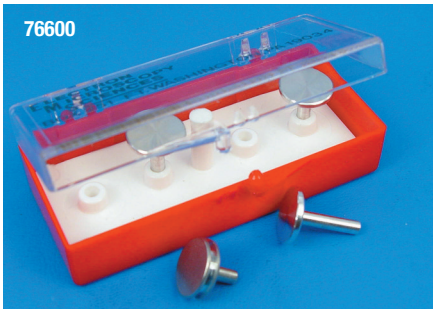


The Gatan storage box has been developed to store 28 of the Gatan 3View pin stubs. Made from clear polystyrene, it has two hinges and a snap-lock. Pins are held by a custom high density closed cell NBR foam with holes. The high density closed cell foam doesn't crumble and is elastic enough to allow repetitive loading and retrieving of the pins. Outside dimensions: 120 x 84 x 36 mm.

**Please see page 36 for Gatan 3View® Pin Stubs.**

| | | |
|---|---|---|
| **75959-08** | Storage box for Gatan pin stubs | each |

### III Specimen Mount Holders

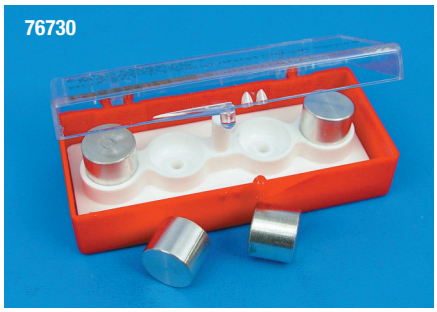



**1) Box with insert and Lid**
Holds 4 of 1⁄2" dia. (12.5mm) surface and 1⁄8" dia. (3.2mm) pin mounts

| Cat. # | Description | Qty |
|---|---|---|
| **76600** | Mount Holder Box, Pin Type | each |
| **76610** | Mount Holder Box, Pin Type | 10/pk |
| **76620** | Mount Holder Box, Pin Type | 100/pk |


**2) Box with Insert and Lid**
Holds 4 of 10mm x 10mm mounts

| Cat. # | Description | Qty |
|---|---|---|
| **76700** | Mount Holder Box for Jeol | each |
| **76710** | Mount Holder Box for Jeol | 10/pk |
| **76720** | Mount Holder Box for Jeol | 100/pk |




**3) Box with Insert and Lid**
Holds 4 of 12.5mm x 12.5mm mounts

| Cat. # | Description | Qty |
|---|---|---|
| **76730** | Mount Holder Box for Jeol 840 | each |
| **76732** | Mount Holder Box for Jeol 840 | 10/pk |
| **76734** | Mount Holder Box for Jeol 840 | 100/pk |


**4) Universal Reversible Mount Holders**
Box with insert and lid; holds 12 of 10 and 15mm diameter mounts or 12 of 3.2mm (1⁄8") pin mounts

| Cat. # | Description | Qty |
|---|---|---|
| **76500** | Universal Mount Holder | each |
| **76510** | Universal Mount Holder | 10/pk |
| **76520** | Universal Mount Holder | 100/pk |


**5) Sample Mount Storage Box**
A soft silicone base in a hinged plastic box; the base has 9 cavities, each 1" (25mm) in diameter and 1⁄4" (6mm) deep. Accommodates up to 9 mounting stubs of either 1" (25mm) in diameter or a 1⁄8" diameter pin.

**Overall measurements:**
4-3⁄4"(L)x3-5⁄8"(W)x1-1⁄4"(H) (12cm x 9.5cm x 3cm).

| Cat. # | Description | Qty |
|---|---|---|
| **76525** | Mount Holder Storage Box | each |



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## Colloidal Compounds & Conductive Adhesives

### Silver Adhesives

**Liquid; Colloidal Silver:** 1-Methoxy-2-propanol base. Fast drying. Average grain size less than 1 µm and Silver content is 60%. Sheet resistance is 0.02 ohm per square inch @ 1 mil thickness. Comes with a brush attached to the cap. Service temperature is 30 minutes at 200°C.

| | | | |
|---|---|---|---|
| RT | **12630** | Silver Liquid | 15g |
| RT | **12641** | Colloidal Silver Extender | 25ml |

**Paste; Colloidal Silver:** Clear Lacquer base. Thick base — ideal for non-flowing requirements. Easily applied with micro-spatula or wooden toothpick. Particle size ranging from 0.4–1 µm. 80% are less than 1µm. Cure in 16–20 hours at room temperature or 30 minutes at 125–150°C.

| | | | |
|---|---|---|---|
| RT | **12640** | Silver Paste | 25g |
| RT | **12641** | Colloidal Silver Extender | 25ml |

### Electrodag 1415M

A silver-based shielding coating which provides electromagnetic compatibility (EMC) and has been specifically designed to give increased coverage while maintaining a very high conductivity. It is a very economic means of achieving excellent shielding against radiated electromagnetic interference (EMI). It maintains its low resistance even after exposure to heat, cold, humidity and salt spray. It is an air drying system that requires no primer or top coat. It is easily applied by spray or included brush and is compatible with plastics commonly used for electronic equipment enclosures.

Electrodag 1415M is designed to replace all discontinued shielding coatings that had contained silver-plated copper.

| | | |
|---|---|---|
| **12697** | Electrodag 1415M | 50 ml |
| **12697-25** | Electrodag 1415M | 25 ml |
| **12697-10** | Silver Paint Thinner | 100 ml |

### Graphite Adhesives

**Water Base:** Flat surface texture. The average flake size is 1µm. Service temperature: 200°C.

| | | | |
|---|---|---|---|
| RT | **12650** | Graphite, Water base | 50g |

**Isopropanol base:** Flat surface texture. The average flake size is 1µm. Service temperature is 65°C.

| | | | |
|---|---|---|---|
| RT | **12660** | Graphite, Isopropanol base | 30g |
| RT | **12661** | Graphite Extender | 30ml |

### Two Part Conductive Silver Epoxy


This electrically conductive silver epoxy is used for adhering samples as well as solderless connections such as bonding in electric design, prototype and repair work, circuit board repair, surface mount connections, static discharge, shielding and grounding. It is also ideal for the bonding of heat sensitive components. Its curing time is within ten minutes at 100°F (38°C), or at room temperature. Conductivity is 0.001 ohm/cm.

| | | |
|---|---|---|
| **12642-14** | Two Part Silver Epoxy | 14g/kit |

### Leit-C-Plast

A special adhesive with very high electrical conductivity and permanent plasticity for the preparation of big specimens in SEM work.

| | | | |
|---|---|---|---|
| RT | **12667** | Leit-C-Plast | 15g |

### Flex Conductive Pen


This micro-tip pen is used for drawing flexible conductive silver traces on Mylar® and any flex circuitry. Dries in minutes. 8.5g (0.3oz)

| | | |
|---|---|---|
| **12645-01** | Flex Conductive Pen | each |

### Conductive Silver Pen


This pen is designed for making instant conductive silver traces. It is ideal for applying samples to SEM stubs. A unique valve tip allows for very smooth flow with normal writing pressure and it is spring loaded to prevent clogging. For conductivity traces, solderable termination's are possible using a 250°F cure for 15-20 minutes. Tin, lead, or silver solder can be used (Do not exceed 350°F for more than 5 seconds). Each pen is filled with approximately 100 feet of traces. Silver content: 39-45% with less than 10 micron diameter. The thinner that is used for this pen is Butyl Acetate.

| | | |
|---|---|---|
| **12644-01** | Conductive Silver Pen, Standard Tip | each |
| **12644-02** | Conductive Silver Pen, Micro Tip | each |

### Opaque White, Extra Fine Pen


Permanently mark on nearly any surface in white color and the marking is waterproof. This pen is ideal for SEM, marking sample identification on carbon tabs, aluminum stubs, conductive tape or any similar surface. The pen contains xylene.

| | | |
|---|---|---|
| **72168-01** | Opaque White Pen | each |

### CCC Carbon Adhesive

An electrically Carbon Conductive Cement for specimen mounting in all SEM work. After drying of the cement, immediate investigation of conductive specimens is possible. Non-conductive specimens need only to be coated with carbon or metal. Thinner is available if the cement viscosity is too thick.

| | | | |
|---|---|---|---|
| RT | **12664** | CCC Adhesive | 30g |
| RT | **12665** | CCC Thinner | 30ml |

### Tempfix Adhesive


A thermoplastic adhesive for mounting powder specimens and small particles for SEM. It does not contain any solvents and it is stable in high vacuum. It is not sticky at room temperature but becomes adhesive at 40°C and melts at 120°C. Tempfix may also be used as an embedding medium.

| | | | |
|---|---|---|---|
| RT | **12668** | Tempfix Adhesive Set | each |

# SEM SUPPLIES

## Colloidal Compounds & Conductive Adhesives

## Certified Conductive Adhesives

*EMS introduces a new reliable line of conductive adhesives which are certified by the Bureau Veritas Quality International.*
***Quality Standards:*** *ISO 9001; EN29001; ANSI/ASQC Q91*

### Silver Conductive 18DB70X

Silver Conductive Coating 18DB70X is a direct substitute for Silver Conductive Fluid 416, which is no longer available. This material was specially formulated for use in geographic areas that demand the use of low VOC (Volatile Organic Compounds) products. It provides low ohms at very thin dry film thickness on almost any surface, and exhibits excellent long term shielding and grounding properties.


| Typical Properties (as supplied, liquid): | |
|---|---|
| **Pigment** | Silver |
| **Binder** | Acrylic |
| **Solids content by weight** | 50.8% ± 5% |
| **Density** | 13.9 lb/gal (1.67kg/l) |

| Typical Properties (as applied): | |
|---|---|
| **VOC** | 0.5 lb/gal (59.6g/l) |
| **Diluent** | Acetone (1:1 ratio by volume) |

**Drying**

5 minutes air dry to touch/10 minutes to handle then 5 minutes at 180°–225°F (82° – 107°C) or air cure for 24 hrs.

| When dried: | |
|---|---|
| **Service temperature** | 300°F (150°C) |
| **Sheet resistance** | 0.015 ohms/sq. in./mil (25µm) |
| **Attenuation** | 75 dB |

| | | | |
|---|---|---|---|
| RT | **12684-15** | Silver Conductive Coating | 15 g |

### TECHNICAL TIP

**Mounting Powders, Granules, And Fibers**

The thermoplastic adhesive, Tempfix (EMS Cat.# 12668), is an excellent smooth embedding medium for stabilizing powders, granules and fibers. Tempfix becomes sticky at 40°C and melts at 120°C. To use: spread a thin layer over a sample support disc and allow to cool. The sample is then sprinkled on the hard surface and the temperature is raised to 40°C for 30-60 seconds and allowed to cool again to room temperature. Excess particles are then removed by gentle brushing or compressed air. At room temperature Tempfix has a smooth featureless surface that allows specimens to be imaged and clearly distinguished from the support media. Silvio Marchese-Ragona, Renee Jobe, Aleda Jacobs. "AFM Preparation Techniques for Bulk and Powder Samples". EMSA Bulletin 22:3 Nov., 1992.

### Silver Conductive Adhesive 503

*A High Temperature Conductive Paint*

Silver paint 503 is a flexible, high temperature conductive material designed for a wide variety of uses, and adheres to most substrates.

**Advantages:**

- **Withstands ambient temperatures of over 500°F (260°C)**
- **Remains flexible over temperature range of –40°F to 500°F**
- **Highly conductive – good adhesion to substrates**
- **Dries at room temperature**
- **Ready to use – easy to apply**

| Typical Properties (as supplied): | |
|---|---|
| **Pigment** | Specially Treated Silver 56% |
| **Binder** | Fluoroelastomer |
| **Carrier** | Methyl Isobuthyl Ketone (MIBK) |
| **Color** | Silver – Consistency: fluid |
| **Density** | 14.6 lbs/gal (1.75kg/L) |
| **Solid content by volume** | 18% |
| **Weight solids** | 62% |
| **Viscosity** | 1700cps |

Shelf life for this product is two years under original seal. Store in cool place

| Typical Properties (as cured): | |
|---|---|
| **Color** | Silver |
| **Service temperature** | 525°F (275°C) |
| **Sheet resistance** | 0.05 ohms/sq. in/1mil dry film |

**Drying**

Air dry coated part approximately 10 minutes (depending on humidity) before carrying out resistance checks. Air dry to touch in 30 seconds and it is ready for use in 2 minutes.

| | | | |
|---|---|---|---|
| RT | **12686-15** | Silver Conductive Adhesive 503 | 15g |

### Silver Conductive Adhesive Paste 478SS

Our adhesive 478SS is a conductive, silver-based polymer which is used for thick film coatings where liquid silver is not an option. Once cured, it offers a very high Tg (glass transition temperature) 153°F (67°C) to prevent blocking, and offers superior adhesion to polyester film. Adhesive 478SS can be cured at 200°F (93°C) within 15 minutes. Higher temperatures will reduce the time needed to achieve a final cure.

| Typical Properties (as supplied): | |
|---|---|
| **Pigment** | Silver |
| **Binder** | Polyester |
| **Color** | Silver |
| **Dilutent** | Carbitol Acetate |
| **Consistency** | Paste (13,000-28,000 cps) |
| **Solid content** | 72.5-75.5% |
| **Flash point** | 230°F (110°C) |
| **Shelf life** | 6 months under original seal |

| Typical Properties (as cured): | |
|---|---|
| **Color** | Silver |
| **Sheet Resistance** | <0.025 ohm/square inch @1 mil |

| | | | |
|---|---|---|---|
| RT | **12685-15** | Silver Conductive Adhesive 478SS | 15g |
| RT | **12685-25** | Silver Adhesive 478SS Thinner | 25ml |

*continued* »»»



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# Certified Colloidal Compounds

## EMS Conductive GOLD Paste


## EMS Conductive Epoxy Gold-Paste

This **EMS one part Epoxy Gold Paste** is a gold-filled conductive bonding, exhibiting high electrical conductivity and bond strength. This Gold Paste is used in preference to silver-epoxy or other silver preparations to avoid silver migration problems, or when a higher signal is required.

This Gold Paste is well suited to all SEM work, and it bonds well to alumina ceramic substrate, phenolic circuit boards, and transistor headers. It is also useful in a variety of applications in solid state and hybrid circuits including attachment, bonding semiconductor devices, heat sinks, capacitor chips.

| Properties : | |
|---|---|
| **Composition:** | 88% Gold |
| **System:** | One-part epoxy |
| **Viscosity:** | 175,000 cps |
| **Pot Life (25°C):** | 6 months |
| **Cure:** | 15 hrs. @150°C, or 1 hr. @ 150°C plus 2 hrs. @200°C |
| **Elec. Resist (Ohm-cm):** | 4 x $10^4$ |
| **Bond Shear Strength:** | 1000 psi |
| **Outgassing (postcure):** | 0.70% 1000 hrs @125°C |
| **Thinner:** | Butyl carbitol acetate or butyl cellosolve acetate |
| **Serv. Temp. Range:** | -65°C to +200°C |

| | | |
|---|---|---|
| **12640** | Gold Epoxy Paste | 2 g |
| **12685-25** | Gold Thinner( Butyl Carbitol Acetate) | 25 ml |

## EMS Conductive Gold-Paste

This EMS Conductive Gold-Paste is a one part adhesive. Fast drying – dries at room temperature. Maximum service temperature is 65°C. This adhesive is not for permanent use, useful for testing and temporary work where a high signal is required from the adhesive.

Gold content is ~75%, including sphere sizes < 2 µm, and flake size <10 µm, in organic binders and a solvent. Keep refrigerated for good shelf life.

Sheet resistance is 0.02 to 0.05 ohm-cm @ 1 mil thickness.

| | | |
|---|---|---|
| **12642** | EMS Conductive Gold-Paste | 2 gm |
| **12643** | Conductive Gold-Paste Extender | 25ml |

## Graphite Conductive Adhesive 154

Adhesive 154 is an easy-to-apply resistance coating designed to provide high lubricity, conductivity, and excellent release properties to many non-conductive substrates, including most plastics. It is made from a dispersion of colloidal graphite in an isopropanol base which quickly air-dries, forms an uniform thin film adherent layer. Air dries to touch in 5 minutes and is ready for use in 30 minutes. After air drying, bake for 5 minutes at 167°F (75°C) to achieve optimum coating qualities in a shorter curing cycle.

| Typical Properties (as supplied): | |
|---|---|
| **Pigment** | Graphite |
| **Color** | Black |
| **Binder** | Cellulosic resin |
| **Carrier** | Isopropanol |
| **Dilutent** | Isopropanol or equivalent |
| **Consistency** | Liquid |
| **Weight solids** | 20% |
| **Volume solids** | 14% |
| **Flash point** | 52°F (11°C) |
| **Shelf life** | 6 months under original seal |

| Typical Properties (as cured): | |
|---|---|
| **Color** | Matte black |
| **Service temp.** | 150°F (65°C) |
| **Sheet resistance** | 1.2 K ohms/sq inch @ 1 mil dry film |

| | | | |
|---|---|---|---|
| RT | **12691-30** | Graphite Conductive Adhesive 154 | 30g |

## Graphite Conductive Adhesive 112

Adhesive 112 is an air drying graphite coating of unusually high conductivity. It provides excellent static bleed properties and acts as a protective energy absorbing layer. It also offers good shielding performance (30-50 db over 50-450 MHz) at a coating thickness of 2 mils. It is water based and useful in solvent prohibited applications.

**To use:** Air dry until all water has flashed off. Air dries to touch in 20 minutes, to handle in 25 minutes. It will continue to harden for 24 hours. It can be forced dried at temperatures up to 160°F (71°C).

| Typical Properties (as supplied): | |
|---|---|
| **Pigment** | Graphite |
| **Binder** | Acrylic |
| **Dilutent** | None |
| **Color** | Black |
| **Solid content** | 34% |
| **Shelf life** | 6 months under original seal |

| Typical Properties (as cured): | |
|---|---|
| **Color** | Black |
| **Service temp.** | 350°F (190.8°C) |
| **Sheet resistance:** | 20 ohms/square inch @ 1 mil dry film |

| | | | |
|---|---|---|---|
| RT | **12693-30** | Graphite Conductive Adhesive 112 | 30g |

# SEM SUPPLIES

## Colloidal Compounds & Conductive Adhesives (continued)

### Certified Colloidal Compounds (continued)

### Carbon Conductive Adhesive 502

*A High Temperature Conductive Paint*

Conductive Adhesive 502 is a combination of specially processed carbon particles in a fluoroelastomer resin system designed to provide high resistance values. In its cured form, it exhibits both high and low temperature flexibility and moisture resistance.

**Advantages:**

- Withstands ambient temperatures of over 500°F (260°C)
- Remains flexible over temperature range of –40°F to over 500°F (260°C)
- Cures at room temperature
- Good adhesion to a variety of substrate
- Excellent oxidation resistance
- Ready to use - easy to apply

| Typical Properties (as supplied): | |
|---|---|
| **Pigment** | Specially Processed Carbon |
| **Binder** | Fluoroelastomer |
| **Diluent** | Methyl Ethyl Ketone (MEK) |
| **Color** | Black |
| **Consistency** | Fluid |
| **Density** | 7.2lbs/gal (0.87 kg/l) |
| **Solid content by weight** | 13% |
| **Viscosity** | 600 ± 200 mPas (Brookfield RVT @ 20rpm) |
| **Flash point** | 23°F (-°5C) |

Shelf life for this product is one year under original seal. Store in cool place

| Typical Properties (as cured): | |
|---|---|
| **Color** | Black |
| **Maximum service Temperature:** | 525°F (275°C) |
| **Sheet resistance** | 130 ± 100 ohms/sq.in./1 mil dry film |

**Drying**

Air drying of the product is adequate for most applications. To assure complete solvent loss, the coating can be baked for 15 minutes at 302°F (150°C)

RT **12694-30** Carbon Conductive Paint 502 30 g

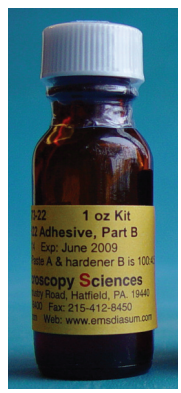
### Graphite Spray

An easy to use graphite spray to coat small samples. Its electrical resistance is 1-2 Kohm/sq" at 1 mil thickness. It is fast drying and produces a very flat, thin, and uniform graphite film. Its service temperature is up to 204°C.

**12648** Graphite Spray 450g


### EPO-TEK — Epoxy Conductive Adhesive

### EPO-TEK® H20E


Epo-Tek® H20E is a two component, 100% solid silver-filled epoxy system, silver-resin paste and liquid hardener, mixing ration is 1:1.

- Epo-Tek H22E features high thermal conductivity, and is very well suited for extensive high temperature applications (300 – 400°C)
- Epo-Tek H20E is also a conductive adhesive of choice for old or new applications.
- Its applications include: chip bonding and electronic bonding as well as SEM mounting.
- H20E contains no solvents and will not outgas.
- When cured, H20E is resistant to solvents, resin and moisture
- Long Pot life (2½ days)
- Shelf life is one year when store at 23°C

***Maximum Bond Line Cure Schedules:***

175°C.....15 minutes
150°C .....1 hour
120°C.....2 hours
80°C.....24 hours

**Typical Properties** *(to be used as a guide only, not a specification)*

| Physical Properties: | |
|---|---|
| **Color:** | Part A – silver; Part B – silver |
| **Consistency:** | Smooth, thixotropic |
| **Viscosity (@ 100 RPM / 23°C):** | 2,200 – 3,200 cPs |
| **Thixotropic Index:** | 3.69 |
| **Glass Transition Temp (Tg):** | ≥ 80°C (Dynamic cure 20 – 200°C / ISO 25 Min; Ramp -10 – 200°C @20°C/Min) |
| **Coefficient of Thermal Expansion (CTE):** | Below Tg: 31 x $10^{-6}$ in/in/°C<br>Above Tg: 158 x $10^{-6}$ in/in/°C |
| **Shore D Hardness:** | 75 |
| **Lap Shear Strength @ 23°C:** | 1,475 psi |
| **Die Shear Strength @ 23°C:** | ≥ 5 kg / 1,700 psi |
| **Weight Loss:** | @200°C: 0.59%; @250°C: 1.09%; @300°C: 1.67% |
| **Degradation Temp (TGA):** | 425°C |
| **Operating Temp:** | Continuous: -55°C to 200°C<br>Intermittent: -55°C to 300°C |
| **Storage Modulus @ 23°C:** | 808, 700 psi |
| **Ion:** | $Cl^-$ 73 ppm; $Na^+$ 2 ppm; $NH_4^+$ 98 ppm; $K^+$ 3 ppm |
| **Particle Size:** | ≤ 45 microns |
| **Electrical Properties:** | |
| **Volume Resistivity @ 23°C:** | ≤ 0.0004 Ohm-cm |
| **Thermal Properties** | |
| **Thermal Conductivity:** | 2.50 W/mK |
| **Thermal Conductivity:** | 29 W/mK Based on Thermal Resistance Data: R=L x K-1 x A-1 |
| **Thermal Resistance:** | (Junction to Case): TO-18 package with nickel-gold metalized 20 x 20 mil chips and bonded with Epo-Tek H20E (2 mil thick) |
| **Epo-Tek®H20E:** | 6.7 to 7.0°C/W |
| **Solder:** | 4.0 to 5.0°C/W |

RT **12671-20E** Epo-Tek® H20E Adhesive 1 oz

*continued* »»»



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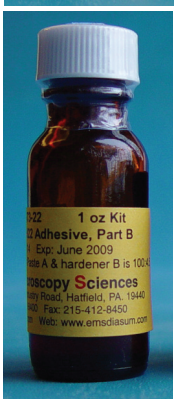



# EPO-TEK – Epoxy Conductive Adhesive (continued)

## EPO-TEK® H20S

Epo-Tek® H20S is a modified version of Epo-Tek®H20E. Epo-Tek® H20S is a highly reliable, two component, silver-filled epoxy with a smooth, thixotropic consistency (mixing ratio 1:1). This modified version offers high electrical conductivity, short curing cycles, proven reliability, and the convenient mix ratio, Epo-Tek® H20S is extremely simple to use. Epo-Tek® H20S pot life is 2.5 days and shelf life is one year when store at room temperature.

***Maximum Bond Line Cure Schedules:***

175°C .....45 seconds
150°C .....5 minutes
120°C .....15 minutes
100°C .....45 minutes
80°C .....90 minutes

### Typical Properties *(to be used as a guide only, not a specification)*

| Physical Properties: | |
|---|---|
| **Color:** | Part A – silver; Part B – silver |
| **Consistency:** | Smooth, thixotropic – 4000 cPs |
| **Viscosity (@ 100 RPM / 23˚C):** | 1,800 – 2,800 cPs |
| **Thixotropic Index:** | 5 |
| **Glass Transition Temp (Tg):** | ≥ 80˚C (Dynamic cure 20 – 200˚C / ISO 25 Min; Ramp -10 – 200˚C @20˚C/Min) |
| **Coefficient of Thermal Expansion (CTE):** | Below Tg: 31 x $10^{-6}$ in/in/˚C<br>Above Tg: 120 x $10^{-6}$ in/in/˚C |
| **Shore D Hardness:** | 57 |
| **Lap Shear Strength @ 23˚C:** | 1,240 psi |
| **Die Shear Strength @ 23˚C:** | ≥ 5 kg / 1,700 psi |
| **Weight Loss:** | @200˚C: 0.40%; @250˚C: 0.60%; @300˚C: 1.37% |
| **Degradation Temp (TGA):** | 414˚C |
| **Operating Temp:** | Continuous: -55˚C to 200˚C<br>Intermittent: -55˚C to 300˚C |
| **Storage Modulus @ 23˚C:** | 339, 720 psi |
| **Ion:** | $Cl^-$ 162 ppm; $Na^+$ 0 ppm<br>$NH_4^+$ 282 ppm |
| **Particle Size:** | ≤ 20 microns |
| **Electrical Properties:** | |
| **Volume Resistivity @ 23˚C:** | ≤ 0.0005 Ohm-cm |
| **Thermal Properties** | |
| **Thermal Conductivity:** | 3.25 W/mK |

RT **12672-20S** Epo-Tek® H20S Adhesive 1 oz

## EPO-TEK® H22

Epo-Tek® H22 is a two component, silver-filled epoxy system. Mixing ratio of silver resin paste and liquid hardener is 100:4.5. Pot life 16 hours, and shelf life is 6 months at room temperature.

- Smooth, free-flowing, slightly thixotropic paste
- High Tg allows it to be used for high temperature applications ≤300°C)
- Contains no solvents – It is a NASA approved low outgassing epoxy.
- Excellent resistance to solvents, chemicals and moisture
- Extended pot life and fast curing at low temperature <100°C
- Designed for die bonding and sealing hybrid circuit. Recommended for SEM small angle cleavage and wafer bonding.

***Maximum Bond Line Cure Schedules:***

150°C.....5 minutes
120°C.....10 minutes
100°C.....20 minutes
80°C.....45 minutes

### Typical Properties *(to be used as a guide only, not a specification)*

| Physical Properties: | |
|---|---|
| **Color:** | Part A – silver; Part B – amber |
| **Consistency:** | Smooth, flowing paste |
| **Viscosity (@ 100 RPM / 23˚C):** | 12,000 – 20,000 cPs |
| **Thixotropic Index:** | 2.36 |
| **Glass Transition Temp (Tg):** | ≥ 100˚C (Dynamic cure 20 – 200˚C / ISO 25 Min; Ramp -10 – 200˚C @20˚C/Min) |
| **Coefficient of Thermal Expansion (CTE):** | Below Tg: 39 x $10^{-6}$ in/in/˚C<br>Above Tg: 224 x $10^{-6}$ in/in/˚C |
| **Shore D Hardness:** | 80 |
| **Lap Shear Strength @ 23˚C:** | 1,980 psi |
| **Die Shear Strength @ 23˚C:** | ≥ 5 kg / 1,700 psi |
| **Weight Loss:** | @200˚C: 0.09%; @250˚C: 0.23%; @300˚C: 1.42% |
| **Degradation Temp (TGA):** | 454˚C |
| **Operating Temp:** | Continuous: -55˚C to 250˚C<br>Intermittent: -55˚C to 350˚C |
| **Storage Modulus @ 23˚C:** | 540, 120 psi |
| **Ion:** | $Cl^-$ 175 ppm; $Na^+$ 60 ppm<br>$NH_4^+$ 148 ppm; $K^+$ 6 ppm |
| **Particle Size:** | ≤ 45 microns |
| **Electrical Properties:** | |
| **Volume Resistivity @ 23˚C:** | ≤ 0.005 Ohm-cm |
| **Thermal Properties** | |
| **Thermal Conductivity:** | .94 W/mK |

RT **12673-22** Epo-Tek® H22 Adhesive 1 oz

# SEM SUPPLIES

## Colloidal Compounds & Conductive Adhesives (continued)

### Krazy Glue™ Pen


The one we all know and have used. Ready to use. Requires no mixing or preparation. This pen contains cyanoacrylate. Clear in color and bonds immediately. Comes in a 3g tube.

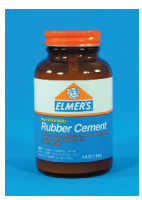
| | | | |
|---|---|---|---|
| RT | **12646-05** | Krazy Glue™ Pen | each |

### Mikrostik™ Adhesive, Non-Conductive

Fast drying, ultrathin clear adhesive suitable for mounting small particles which can be submerged in other adhesives. It can be diluted with methyl ethyl ketone. Quick-drying. Comes in a bottle with an applicator brush. 14 ml.

| | | |
|---|---|---|
| **12646-01** | Mikrostik™ Adhesive, Non-Conductive | 14ml |

### Rubber Cement




Excellent adhesive for all paper pasting and mountings of drawings and photographs. It is also used to adhere specimens to SEM Stubs. Any excess cured cement can be easily removed. A 4 oz bottle comes with a brush in the cap.

| | | |
|---|---|---|
| **72170** | Rubber Cement | each |

### Low Temperature Hot Glue Gun


This low temperature mini glue gun is safe and allows for the easy application of the melt glue to the aluminum stub for the mounting of bulk or irregular shaped specimens for SEM. Comes complete with a 40" cord, and two glue sticks. Accepts 5/16" diameter all temperature or low temperature glue sticks. 110 volt, 10 watts.

| | | |
|---|---|---|
| **72171-00** | Low Temp Hot Glue Gun | each |
| **72171-10** | Low-Temp Glue Sticks | 10/pk |

### Adhesive Tabs

Press these self-sticking adhesive tabs to the surface of an SEM mount, then lift off tab for applying the sample. Each box contains 72 sheets of 36 tabs each. Tab measures 12mm in diameter. Non-conductive.

| | | |
|---|---|---|
| **76760** | Adhesive Tabs | 2592 tabs/box |

### Conductive "Lift-N-Press" Adhesive Tabs


This ½" (12mm) diameter conductive tabs are similar to our adhesive tabs, but they work like carbon adhesive tabs. Just remove tab from the roll, press onto surface where you want the film, lift "tab" and peel it off. The tabs can be cut to desired size before being removed from its backing, for use on smaller samples.

- Smoother background – over 99% transparent to EDS
- High strength adhesive
- Better particle detection
- Adhesive only 0.002" thick
- Content a traces of nickel (<0.6%) and copper (<0.3%)
- 250 tabs per roll.
- An affordable double-sided conductive tab for all SEM samples.

| | | |
|---|---|---|
| **76762-01** | Conductive Adhesive Tabs | 250/roll |

### Kapton® Polyimide Film Tape

Kapton® Polyimide Tape is known for its superior ability to maintain its physical properties under harsh conditions. This general purpose film easily bonds to difficult surfaces with silicone adhesive, and leaves little to no residue when removed. Microscopists find it ideal for holding samples or masking during deposition in vacuum systems (it is relatively low outgassing). It is also perfect for positioning samples in cryo or high temperature working conditions. There are no known organic solvents for the film.

Kapton® is a trademark of DuPont™

#### SPECIFICATIONS

| | |
|---|---|
| **Temperature Range** | -269 to 400°C (-452 to 752°F) |
| **Adhesive** | Silicone |
| **Flammability Ratio** | V-0 |
| **Roll Length** | 32.9 m (36 yds) |
| **Color** | Amber |
| **Kapton® Film Thickness** | 1 mil |
| **Ultimate Tensile Strength** (Mpa) | 231 (73°F); 134 (392°F) |
| **Ultimate Elongation** (%) | 72 (73°F); 83 (392°F) |
| **Density,** g/cc | 1.42 |
| **Tensile Modulus** (GPa) | 2.5 (73°F); 2.0 (392°F) |
| **Melting Point** | none |
| **Plastic Core Diameter** | 77mm (3") |

### Kapton® Standard Polyimide Film Tape

Tape thickness with adhesive: 2.7 mil. No liner.

| | | | |
|---|---|---|---|
| **77708-01** | Kapton® Standard Tape, ¼" | 36 yds | each |
| **77708-02** | Kapton® Standard Tape, ½" | 36 yds | each |
| **77708-03** | Kapton® Standard Tape, ¾" | 36 yds | each |
| **77708-04** | Kapton® Standard Tape, 1" | 36 yds | each |
| **77708-05** | Kapton® Standard Tape, 2" | 36 yds | each |

### Kapton® Single-Sided, Thin Adhesive Polyimide Film Tape

Tape thickness with thinner layer of adhesive: 2.5 mil. No liner.

| | | | |
|---|---|---|---|
| **77708-06** | Kapton® Thin Tape, ¼" | 36 yds | each |
| **77708-07** | Kapton® Thin Tape, ½" | 36 yds | each |
| **77708-08** | Kapton® Thin Tape, ¾" | 36 yds | each |
| **77708-09** | Kapton® Thin Tape, 1" | 36 yds | each |
| **77708-10** | Kapton® Thin Tape, 2" | 36 yds | each |

### Kapton® Double-Sided Polyimide Film Tape

Tape thickness with adhesive on both sides: 4 mil. Clear polyester liner covers one side.

| | | | |
|---|---|---|---|
| **77708-11** | Kapton® Double-Sided Tape, ½" | 36 yds | each |
| **77708-12** | Kapton® Double-Sided Tape, ¾" | 36 yds | each |
| **77708-13** | Kapton® Double-Sided Tape, 1" | 36 yds | each |

### Kapton® Low-Static, Single-Sided, Thin Adhesive Polyimide Film Tape

ESD additive in the adhesive reduces the static charge. Tape thickness with adhesive: 2.6 mil. No liner.

| | | | |
|---|---|---|---|
| **77708-14** | Kapton® Low-Static Tape, ¼" | 36 yds | each |
| **77708-15** | Kapton® Low-Static Tape, ½" | 36 yds | each |
| **77708-16** | Kapton® Low-Static Tape, ¾" | 36 yds | each |
| **77708-17** | Kapton® Low-Static Tape, 1" | 36 yds | each |
| **77708-18** | Kapton® Low-StaticTape, 2" | 36 yds | each |



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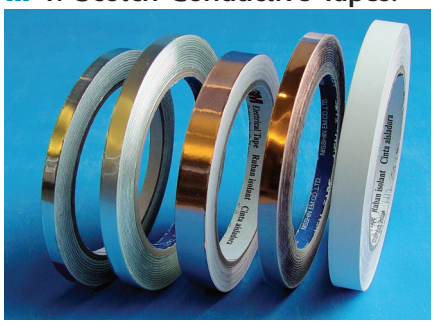
## Colloidal Compounds & Conductive Adhesives (continued)

### Conductive Adhesive Tapes

### 1) Scotch Conductive Tapes:



We offer two types of foil: Aluminum foil tape (Scotch 1170) and copper foil tape (Scotch 1181) with conductive adhesive. 3" core, ¼" (6.35mm) width x 54 ft (16.5m) long

| Technical Data | Copper | Aluminum |
|---|---|---|
| Foil Thickness, mils | 1.4 | 2 |
| Total Thickness, mils (mm) | 3(.076) | 4(.102) |
| Adhesion oz/In (N/10mm) | 35(3.81) | 35(3.81) |
| Electrical Resistance | | |
| Through Adhesive ohm/in(ohm/cm) | .005(.032) | .01(.07) |
| Continuous Long Term °C | 155° | 155° |
| Functional Days-Weeks °C | 175° | 175° |

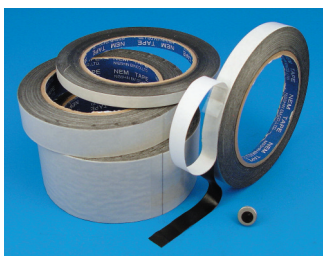
| | | |
|---|---|---|
| **77800** | Aluminum Tape, Single Sided ¼" x 18yds | 1 roll |
| **77799** | Aluminum Tape, Single Sided ½" x 18yds | 1 roll |
| **77798** | Aluminum Tape, Single Sided 1" x 18yds | 1 roll |
| **77801** | Copper Tape, Single Sided ½" x 18yds | 1 roll |
| **77802** | Copper Tape, Single Sided ¼" x 18yds | 1 roll |

**Double Sided Copper Conductive Tape**

With the same technical properties of our 77802 shown above this conductive tape is 12.7mm(W)x16.4m(L).

**77802-22** Copper Conductive Tape, Double Sided each

### 2) SEM Conductive Tapes:



| Technical Data | Cu Contained Nickel Tape | Al Contained Nickel Tape |
|---|---|---|
| PAD | Pressed thin Cu | Pressed thin Al |
| Overall Thickness | 0.075mm | 0.09mm |
| PAD | 0.035mm | 0.05mm |
| Adhesive | 0.040mm | 0.04mm |
| Conductive resistivity | 0.004ohm/sq. Inch | 0.008ohm/sq. Inch |
| Adhesive Power/25mm width | 920 gf | 840 gf |
| Capacity after 60 min | 0.1mm | 0.1mm |

We now offer a new line of conductive tapes, that are electrically conductive and offer a clean background. They were developed especially for SEM.

| | | |
|---|---|---|
| **77810** | Copper/Nickel Tape | each |
| **77811** | Copper/Nickel Tape | 5 Rolls/pk |
| **77813** | Aluminum/Nickel Tape | each |
| **77814** | Aluminum/Nickel Tape | 5 Rolls/pk |

### 3) Double Sided Carbon Tape

With carbon double-sided tape, small particle sizes, such as 15-20 microns, can be mounted on the adhesive and produce good background structure. Our Double sided Carbon tape is also available in five widths to accommodate varying specimen mount surface sizes and applications.

| Double sided Carbon Tape | |
|---|---|
| **PAD** | Isolate unwoven cloth |
| **Overall Thickness** | 0.16mm |
| **PAD** | 0.07mm |
| **Adhesive** | 0.045mmx2 |
| **Conductive resistivity** | 50ohm/sq. Inch |
| **Adhesive Power/25mm width** | 1,000 gf |
| **Capacity after 60 min** | 0.2mm |

| | | |
|---|---|---|
| **77816** | Double Sided Adhesive Carbon Tape 8mm(W) x 20m(L) (5/16" x 65) | each |
| **77817** | Double Sided Adhesive Carbon Tape 8mm(W) x 20m(L) (5/16" x 65) | 5 Rolls/pk |
| **77817-05** | Double Sided Carbon Tape, 5mm(W)x20m(L) | each |
| **77817-12** | Double Sided Carbon Tape, 12mm(W)x20m(L) | each |
| **77817-20** | Double Sided Carbon Tape, 20mm(W)x20m(L) | each |
| **77817-50** | Double Sided Carbon Tape, 50mm(W)x20m(L) | each |

***Same as above however with Aluminum base as opposed to the unwoven base above. Offers a smoother surface***

| | | |
|---|---|---|
| **77817-05-Al** | Double Sided Carbon Tape, 5mm(W)x20m(L) | each |
| **77817-08-Al** | Double Sided Carbon Tape, 8mm(W)x20m(L) | each |
| **77817-12-Al** | Double Sided Carbon Tape, 12mm(W)x20m(L) | each |
| **77817-20-Al** | Double Sided Carbon Tape, 20mm(W)x20m(L) | each |
| **77817-50-AL** | Double Sided Carbon Tape, 50mm(W)x20m(L) | each |

### 3a) Carbon Conductive Tape, Double Coated

EMS introduces this unique double sided carbon tape which is 260 microns in thickness. The base which is Polycarbonate and 200 microns thick has on both of its sides 30 microns of conductive glue giving it a total thickness of 260 microns. The tape has one transparent liner on one side and a white thicker one on the reverse which protects the tape in shipping.

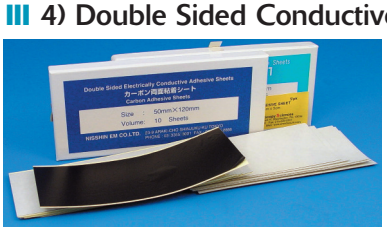
#### SPECIFICATIONS

| | |
|---|---|
| **Core Diameter** | 3" (76mm) |
| **Adhesive** | Carbon Filled Acrylic Glue |
| **Remover** | Ethyl acetate, ethanol, isopropanol and or alcohol |
| **Temperature** | 60ºC(140ºF)-Maximum |
| **Impurities** | Cu, Si, Sb, S, Na, P, Fe and Mg* |

* These are considered to be small impurities but they may be present

| | | |
|---|---|---|
| **77819-12** | Double sided Carbon Conductive Tape, 12mm (W) x 5m (L) | each |
| **77819-25** | Double Sides Carbon Conductive Tape, 25mm (W )x 5m (L) | each |
| **77819-65** | Carbon Conductive Tape in sheet form, 65mm (W )x 300mm (L) | each |

### 4) Double Sided Conductive Cohesive Sheets



***Features:***

- **Minimum impurities - Maximum conductivity.**
- **Produces minimum gas under vacuum conditions.**
- **Easy handling.**

These conductive cohesive sheets offer good adhesion to the specimen and yield good conductivity and background structures, even with particles as small as 15 microns.

**Sheet size:** 5cm(W)x12cm(L)

| Technical Data | Thickness | Adhesive Power | Conductive Resistivity |
|---|---|---|---|
| Silver Sheet | 0.13mm | 880 gf/25mm | 0.00ohm/5mm$^2$ |
| Carbon Sheet | 0.16mm | 1,100 gf/25mm | 4,000ohm/5mm$^2$ |

| | | |
|---|---|---|
| **77820** | Silver Cohesive Sheet | 5/pk |
| **77822** | Carbon Cohesive Sheet | 10/pk |
| **77822-01** | Carbon Cohesive Sheet (Technical Grade) | 10/pk |

# SEM SUPPLIES

## Conductive Adhesives Tabs, Tape, and Sheets

### XYZ-Axis Electrically Conductive, 3M™ Double Sided Tape 9712

3M™ XYZ-Axis Electrically Conductive Tape 9712 is an isotropically conductive pressure sensitive tape. The tape consists of a 3M adhesive loaded with conductive fibers. The result is a double-sided tape providing both good adhesion and good electrical performance with very high conductivity.

The 9712 Tape is an excellent choice when needing to bond your samples for all SEM work.

#### SPECIFICATIONS

| | |
|---|---|
| **Adhesive Type** | Filled Acrylic |
| **Filler Type** | Conductive Fibers |
| **Release Liner** | Silicone treated PolyCoated Kraft Paper |
| **Remover** | Acetone |
| **Thickness Approximate** | Tape Only; .005" (.127mm)<br>Release Liner; .004" (.010mm) |
| **Temperature Range** | Short Term Exposure; 250ºF (121ºC)<br>Long Term Exposure; 158ºF (70ºC) |

**Electrical Properties: Contact Resistance**

| Substrate Tested | | | |
|---|---|---|---|
| **Aluminum/ Aluminum** | **Aluminum/ Stainless Steel** | **Copper/ Aluminum** | **Copper/ Copper** |
| <24Ω | <21.5Ω | <16Ω | <.66Ω |

Based upon four wire (Kelvin probe) resistance measurements made with crossed pieces of Foil/Type 9712 or 9713/Rigid plate construction using a 1.0" x 1.0" square piece of 3M tape Type 9712 or 9713. The rigid metal surface was prepared with a Scotch-Brite™ pad to roughen the surface and cleaned with isopropyl alcohol.

**Adhesion Properties:**

| | Adhesion in oz./in (g/cm) | | | |
|---|---|---|---|---|
| **Substrate** | **20 Min at 72°F (22°C)** | **24 Hours at 72°F (22°C)** | **20 Min at 158°F (70°C)** | **24 Hours at 72°F (22°C)** |
| Stainless Steel | >41(457) | >42(468) | >43(479) | >53(590) |
| Aluminum | >35(390) | >33(367) | >36(401) | >43(479) |
| Copper | >47(412) | >39(434) | >43(479) | >55(613) |

#### ORDERING INFORMATION

The tape is available in 3 sizes and it comes on a 3" Core(76mm)

| Cat. # | Description | Qty |
|---|---|---|
| **77808-63** | XYZ-Axis Electrically Conductive, 3M™ Double Sided Tape, 9712, 6.35mm (W) x 32.9m (L) | each |
| **77808-12** | XYZ-Axis Electrically Conductive, 3M™ Double Sided Tape, 9712, 12.7mm (W) x 32.9m (L) | each |
| **77808-25** | XYZ-Axis Electrically Conductive, 3M™ Double Sided Tape, 9712, 25mm (W) x 32.9m (L) | each |

### XYZ-Axis Electrically Conductive, 3M™ Double Sided Tape 9713

3M™ XYZ-Axis Electrically Conductive Tape 9713 is an isotropically conductive pressure sensitive tape. 3M tape 9713 conducts electricity through the thickness (Z-axis) and in the plane of the adhesive (X, Y planes) and is ideal for EMI/RFI shield and EMI/RFI gasket attachment to metal surfaces. The tape consists of a high performance 3M adhesive loaded with conductive fibers. The result is a double-sided tape providing both good adhesion and good electrical performance. The conductive fibers in 3M tape 9713 also provide improved handling characteristics. The 9713 Tape is an excellent choice when needing to bond your samples for all SEM work

#### SPECIFICATIONS

| | |
|---|---|
| **Adhesive Type** | Filled Acrylic |
| **Filler Type** | Conductive Fibers |
| **Release Liner** | Silicone treated PolyCoated Kraft Paper |
| **Remover** | Acetone |
| **Thickness Approximate** | Tape Only; .0035" (.0889mm)<br>Release Liner; .004" (.010mm) |
| **Temperature Range** | Short Term Exposure; 250ºF (121ºC)<br>Long Term Exposure; 158ºF (70ºC) |
| **Outgassing (ASTM E-595)** | Total Mass Loss (TML); 1.60%<br>Collected Volatile Condensed Materials (CVCM): 0.03%<br>Water Vapor Recovered (WVR) 0.36% |

**Electrical Properties: Contact Resistance**

| Substrate Tested | | | |
|---|---|---|---|
| **Aluminum/ Aluminum** | **Aluminum/ Stainless Steel** | **Copper/ Aluminum** | **Copper/ Copper** |
| <2.5Ω | <2.0Ω | <1.0Ω | <0.5Ω |

Based upon four wire (Kelvin probe) resistance measurements made with crossed pieces of Foil/Type 9712 or 9713/Rigid plate construction using a 1.0" x 1.0" square piece of 3M tape Type 9712 or 9713. The rigid metal surface was prepared with a Scotch-Brite™ pad to roughen the surface and cleaned with isopropyl alcohol.

**Adhesion Properties:**

| | Adhesion in oz./in (g/cm) | | | | |
|---|---|---|---|---|---|
| **Substrate** | **15 min. at 72°F (22°C)** | **1 hr. at 72°F (22°C)** | **24 hr. at 72°F (22°C)** | **1 hr. at 158°F (70°C)** | **24 hr. at 158°F (70°C)** |
| Stainless Steel | > 30 (335) | > 45 (502) | > 50 (558) | > 50 (558) | > 55 (613) |
| Aluminum | > 20 (223) | > 35 (390) | > 40 (446) | > 40 (446) | > 55 (613) |
| Copper | > 20 (223) | > 40 (446) | > 45 (502) | > 40 (446) | > 60 (669) |

#### ORDERING INFORMATION

The tape is available in 5 sizes and it comes on a 3" Core(76mm)

| Cat. # | Description | Qty |
|---|---|---|
| **77809-12** | XYZ-Axis Electrically Conductive, 3MTM Double Sided Tape, 9713, 12.7mm (W) x 32.9m (L) | each |
| **77809-25** | XYZ-Axis Electrically Conductive, 3MTM Double Sided Tape, 9713, 25mm (W) x 32.9m (L) | each |
| **77809-100** | XYZ-Axis Electrically Conductive, 3MTM Double Sided Tape, 9713, 100mm (W) x 32.9m (L) | each |
| **77809-60** | XYZ-Axis Electrically Conductive, 3MTM Double Sided Tape, 9713, 0.61m (W) x 98.6m (L) | each<br>each |
| **77809-61** | XYZ-Axis Electrically Conductive, 3MTM Double Sided Tape, 9713, 0.61m (W) x 32.9m (L) | each |



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Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

## Conductive Adhesives Tabs, Tape, and Sheets (continued)

### Z-Axis Electrically Conductive, 3M™ Double Sided Tape, 9703

3M™ Electrically Conductive Adhesive Transfer Tape 9703 is a pressure sensitive adhesive (PSA) transfer tape with anisotropic electrical conductivity. The PSA matrix is filled with conductive particles which allow interconnection between substrates through the adhesive thickness (the "Z-axis") but are spaced far enough apart for the product to be electrically insulating in the plane of the adhesive. The PSA tack properties and lack of any thermal curing make tape 9703 easy to use in all applications requiring a conductive tape.

#### SPECIFICATIONS

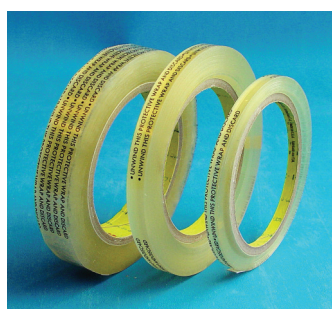
| | |
|---|---|
| **Adhesive Type** | Filled Acrylic Pressure Sensitive |
| **Release Liner** | Silicone treated PolyCoated Kraft Paper |
| **Remover** | Acetone |
| **Temperature Range** | Short Term Exposure; 250ºF (121ºC)<br>Long Term Exposure; 158ºF (70ºC) |
| **Outgassing (ASTM E-595)** | Total Mass Loss (TML); 0.7% |

#### ORDERING INFORMATION

The tape is available in 2 sizes and it comes on a 3" Core (76mm)

| Cat. # | Description | Qty |
|---|---|---|
| **77809-70** | Z-Axis Electrically Conductive, 3MTM Double Sided Tape 9703, 6.35mm x 32.9m (1/4" x 36yrds) | each |
| **77809-80** | Z-Axis Electrically Conductive, 3MTM Double Sided Tape 9703, 12.7mm x 32.9m (1/2" x 36yrds) | each |

### Scotch Double Sided Tape:



#### 1) Without backing paper: Scotch 665

This is a non-conductive transparent tape with adhesive on both sides. There is no liner to remove and it is long lasting for permanent applications. 3" (77mm) core.

| Cat. # | Description | Qty |
|---|---|---|
| **77100** | 3M® 665, Double Sided, ¼" W x 36yds (6.4mm x 32.9m) | each |
| **77110** | 3M® 665, Double Sided, ¼" W x 36yds (6.4mm x 32.9m) | 5/box |
| **77101** | 3M® 665, Double Sided, ⅜" W x 72yds (9.5mm x 65.8m) | each |
| **77102** | 3M® 665, Double Sided, ¾" W x 36yds (19mm x 32.9m) | each |

#### 2) With paper liner: Scotch 666

This is a non-conductive transparent tape with adhesive on both sides and white paper as a liner, which is slit in the center to facilitate its removal. This produces good adhesion and cleanliness. Comes 3 rolls inside a protective box, 3" core, ¼" (6.35mm) W x 36 yds (32.9m) L.

| Cat. # | Description | Qty |
|---|---|---|
| **77115** | 3M® 666, Double Sided, ¼" W x 72yds (6.4mmx32.9m) | each |
| **77116** | 3M® 666, Double Sided, ¼" W x 36yds (6.4mmx32.9m) | 5/pk |
| **77117** | 3M® 666, Double Sided, ⅜" W x 36yds (9.5mmx32.9m) | each |
| **77118** | 3M® 666, Double Sided, ¾" W x 36yds (19mmx32.9m) | each |
| **77119** | 3M® 666, Double Sided, 1"Wx36yds (25.4mm x 32.9m) | each |

## RELATED PRODUCTS...

Additional Adhesives


### Loctite Adhesives

**Loctite 409™ Super Bonder®**
A general-purpose gel adhesive.

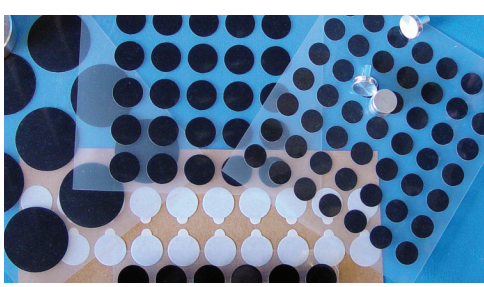
**Loctite 454™ Prism®**
For use with porous surfaces.

**Loctite 4861™ Prism®**
For use with flexible surfaces.

**Loctite 349™ Impruv®**
For bond glass/metal, appearance.

**Loctite 4011™ Prism®**
For the assembly of difficult-to-bond materials.

**See page 10.**



### Conductive Carbon Adhesive Tabs

Firm, smooth surfaces for a variety SEM applications, including gunshot residue analysis

**See page 55.**

# SEM SUPPLIES

## QuantomiX WETSEM™ — *A Technological Breakthrough*

- **Attain EM-level imaging of wet samples**
- **Eliminate artifacts & time-consuming sample preparation**
- **Achieve reliable, reproducible & quantifiable results**
- **The biggest breakthrough is coming in a nano-package**

### Introduction

Electron Microscopy Sciences and Quantomix have joined forces here in The United States to market and sell the breakthrough solutions of Quantomix's proprietary WETSEM™ Technology. This technology enables scanning electron microscopes (SEM) to image and analyze wet samples such as cells, tissue biopsies, foods and ink, in their native environment. Eliminating the need for time-consuming preparation procedures, the WETSEM™ Technology ensures that sample integrity is not compromised by artifacts. QuantomiX innovative technology opens new opportunities for application specific tools to improve drug discovery, and advances treatment and diagnostic solutions for the medical and pharmaceutical markets.

### WETSEM™ Technology

Electron Microscopy (EM) is a prime tool for high-resolution imaging, which has been the cornerstone of our understanding of living organisms and our material environment.

Because EM requires samples to be placed in a vacuum, it does not lend itself for use with wet samples. In the 50 years since its development, this drawback has been a major impediment in the use of EM for biomedical research, and for many clinical and industrial applications.

Light Microscopy, on the other hand, requires only minimal sample preparation. However, the resolution of light microscopy is limited to a few hundred nanometers.

The revolutionary technology of QuantomiX solves the problem of preparing wet samples for high-resolution imaging. It closes the resolution gap between conventional electron microscopy and light microscopy and offers the convenient sample preparation of light microscopy.

For the first time, rapid and routine EM imaging of biological samples in a wet environment is now possible without the artifacts normally associated with sample preparation.

### Concept

The New QX capsule completely isolates wet samples from the vacuum in the microscope chamber. This makes possible the imaging of fully hydrated samples- including food, cosmetics, ink, human, animal, plant, and microbial cells, tissues, and fluids-at resolutions unachievable with light microscopy.

The QX capsule fits the standard SEM specimen stage.

The capsule combines the function of a specimen holder, cell culture dish, or a tissue specimen holder with an electron transparent, vacuum tight window. This unique receptacle permits electron microscopy of samples held in water or any other liquid medium at atmospheric pressure.

Imaging of samples in the QX capsule can be accomplished with backscattered electron detection, x-ray detection, or light detection, to reveal structure as well as material composition.

### Applications

- EDS of wet samples with QX capsules
- Experimental Biology
- Pathogen characterization
- Subcellular organelles, cytoskeleton and motility, cell contacts, receptor distribution, extracellular matrix, tissue analysis
- **Industrial applications:** food, oils, dyes, pharmaceuticals
- **Clinical diagnosis:** Histopathology, cytology, oncology
- Tissue engineering, implants and prostheses
- Quality Control/Quality Assurance
- **Life Sciences and Medicine:** Cultured and primary cells/Tissue histology/ Nerve cells and myelin imaging/ Microbiology/Viruses/ and Plants
- Environmental and toxicological applications
- Nanotechnology and Bio nanotechnology
- **Industrial and R & D:** Emulsions/Suspensions/ Foods/Personal care goods/cosmetics/Inks

### Advantages

- Artifacts associated with sample preparation techniques are eliminated.
- Sample preparation time drastically reduced or completely eliminated.
- Direct imaging of wet samples (food, cosmetics, inks, cells, tissues).
- Compositional analysis of wet samples by X-ray microanalysis.
- Wide spectrum of staining and labeling capabilities for cells and tissues.
- Ability to image unstained or unfixed cells and tissues.
- Imaging of both adherent and non-adherent cells.
- High resolution histopathology.
- Intracellular imaging in a scanning EM.
- Imaging the entire cell surface.
- Excellent preservation and imaging of lipid structures.
- Easy-to-automate sample processing and imaging.
- Ability to work with a variety of sample consistencies (pastes, foam, creams, emulsions, etc.).

### Features

- Direct imaging of all types of wet samples, including suspensions, emulsions, creams, cells, and tissues.
- Rapid and simplified sample preparation.
- Compositional analysis of wet samples by X-Ray analysis.
- Excellent preservation and imaging of lipid structures.
- Easy to automate sample processing and imaging.
- Utilizes SEM backscattered electron imaging based on atomic number difference.
- Compatible with light microscopy for comparative studies.
- Single use.



**Electron Microscopy Sciences** In PA: (215) 412-8400 • Toll-Free (800) 523-5874
Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

# WETSEM™ Product Listings

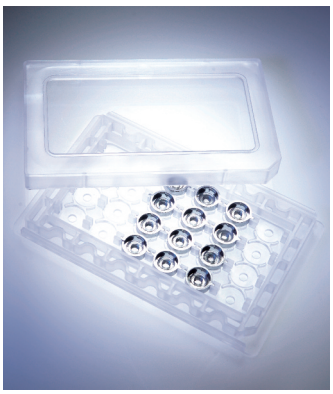
## QX-102 Capsules

The QX-102 Capsules are used for imaging various wet materials and biological samples, such as liquid samples (foods, cosmetics, oils, paints, etc.), particles in solutions, adherent and non-adherent human and animal cells, and microorganisms. The samples can be visualized either directly or by following appropriate contrast enhancement staining or labeling procedures. The capsule serves as a cell culture dish, specifically designed for the SEM. No coating or embedding of the sample are required, enabling electron microscopy imaging with easy sample preparation comparable to light microscopy.

*The QX-102 Capsules are supplied sterile for single use in boxes of 24.*

| Cat. # | Description | Pack |
|---|---|---|
| **QX-102-24** | Cell biology and general liquid | 24/pkg |

## *ACCESSORIES FOR THE QX-102 CAPSULES:*

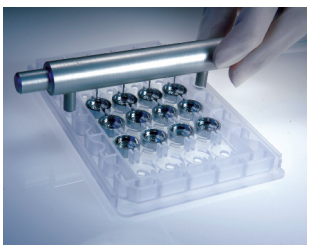


### MP-10 Multi-well Plate

The Multi-well Plate is designed to enable parallel handling of multiple QX-102 Capsules. It serves as a well plate for holding the capsules during various manipulations, for culturing cells in QX-102 Capsules, and for inspection in an inverted light microscope. The Multi-well Plate is specially designed to maintain humidity of the samples during incubation, and is compatible with standard laboratory equipment.

*The Multi-well Plates are supplied sterile for single use in boxes of 2.*

| Cat. # | Description | Pack |
|---|---|---|
| **MP-10-2** | Multi-well Plate | 2/pkg |



### MA-4 Multi-well Aspirator

The Multi-well Aspirator system is designed to safely and conveniently aspirate liquids from the QX-102 capsules, and is required for applications that need liquid exchange in capsules during sample preparation or cell culturing. The multi-well aspirator drains liquids simultaneously from up to four capsules placed in a row in the MP-10 Multi-well Plate.

| Cat. # | Description | Pack |
|---|---|---|
| **MA-4** | Multi-well Aspirator | each |

### QX Aspirator Tips

The QX Aspirator Tips are used to safely and conveniently aspirate liquids from an individual QX-102 capsule with a pipette. The tips fit on any standard pipette, and are designed to ensure safe liquid removal. In cases where multiple capsules will be used or multiple liquid exchanges are required, it is recommended to use the MA-4 Multi-well Aspirator, which drains liquids simultaneously from multiple capsules.

*The QX Aspirator Tips are supplied sterile in boxes of 60.*

| Cat. # | Description | Pack |
|---|---|---|
| **AT-60** | QX Aspirator Tips | 60/pkg |

### QX Imaging Buffer

QX Imaging Buffer is a solution optimized for imaging samples in an SEM with QX-102 capsules and is formulated to minimize damage to the samples by the electron beam. It is applied on samples in the QX-102 capsules prior to SEM imaging.

*The QX Imaging Buffer is supplied sterile and lyophilized.*

| Cat. # | Description | Pack |
|---|---|---|
| **IB-64** | QX-102 Imaging Buffer | each |

### QX-102 Calibration Capsule

The QX-102 Calibration Capsule is a QX-102 Capsule that has been specially designed to assist first time users in finding optimal imaging conditions for WETSEM™ imaging in their SEM. The Calibration Capsule contains nanoparticles of two different sizes; 40 and 500 nm. The particles are easily visualized in an SEM and provide a convenient means to calibrate the parameters for optimal wet imaging conditions.

| Cat. # | Description | Pack |
|---|---|---|
| **RT-56** | QX-102 Calibration Capsule | each |

### PI-24 Particle Imaging Kit

When imaging particles with WETSEM™ Technology, image quality is dependent on the proximity of the particles to the QX-capsule membrane. The closer the particles are, the higher the resolution. Coating the membrane with a suitable charged polymer will attract particles to the membrane and improve the resulting image.

The particle imaging kit provides the WETSEM™ Technology user with the tools and reagents necessary to coat the QX-capsule membrane. Poly-L-Lysine is a positively charged polymer which will attract negatively charged particles. Poly [sodium 4-sulfonate] (PSS) is a negatively charged polymer which will attract positively charged particles. Aspirator tips are designed to safely aspirate the QX-102 capsules, without damaging the capsule membrane. Aspirator tip should be used with a standard calibrated pipette to aspirate liquids from the QX capsule liquid dish. To apply liquids into the liquid dish use conventional tips. The supplied distilled water is used to wash the membrane from residual reagents.

The kit contains:

- Aspirator Tips (24 units)
- Poly-L-Lysine 1% WT (1ml)
- Poly [sodium 4-styrenesulfonate] 0.3%WT (1ml)
- Distilled water (4ml)

| Cat. # | Description | Pack |
|---|---|---|
| **PI-24** | Particle Imaging Kit | each |

# SEM SUPPLIES

## QuantomiX WETSEM™ (continued)

### QX-302 Capsules

The QX-302 Capsules are used for imaging various thick, non-adherent samples, such as tissue biopsies, plants and material specimens, in their natural wet state. The capsule is suitable for variable sample sizes, with a maximum diameter of 3mm and thickness of up to 1mm. No coating or embedding of the sample are required, enabling electron microscopy imaging with easy sample preparation comparable to light microscopy.

*The QX-302 Capsules are supplied sterile for single use in boxes of 6.*

| Cat. # | Description | Pack |
|---|---|---|
| **QX-302-6** | QX-302 Capsules | 6/pkg |

### *ACCESSORIES FOR THE QX-302 CAPSULES*

#### MP-12 Multi-capsule Plate

The Multi-capsule Plate is designed to enable parallel handling of a number of individual QX-302 Capsules. It serves for holding the capsules during specimen preparation, and for storage.

*The Multi-capsule Plates are supplied sterile and intended for single use.*

| Cat. # | Description | Pack |
|---|---|---|
| **MP-12-2** | MP-12 Multi-capsule Plate | 2/pkg |

#### QX-302 Imaging Buffer

QX-302 Imaging Buffer is a solution optimized for imaging samples in an SEM with QX-302 capsules and is formulated to minimize damage to the samples by the electron beam. It is applied on samples in the QX-302 capsules prior to SEM imaging. The QX-302 Imaging Buffer includes spacers that are used during sample preparation.

*The QX-302 Imaging Buffer is supplied sterile and lyophilized.*

| Cat. # | Description | Pack |
|---|---|---|
| **IB-74** | QX-302 Imaging Buffer | each |

#### QX-302 Calibration Capsule

The QX-302 Calibration Capsule is a QX-302 Capsule that has been specially designed to assist first time users in finding optimal imaging conditions for WETSEM™ imaging in their SEM. The Calibration Capsule contains nanoparticles of two different sizes; 40 and 500 nm. The particles are easily visualized in an SEM and provide a convenient means to calibrate the parameters for optimal wet imaging conditions.

| Cat. # | Description | Pack |
|---|---|---|
| **RT-58** | QX-302 Calibration Capsule | each |

### QX-202 Capsule

QX-202 capsules are used for in-situ SEM imaging of various dynamic hydration processes. They can be used for imaging the hydration process of cement, gypsum and other materials. The unique design of the QX-202 capsules allows extended studies to be performed inside the SEM vacuum chamber - the dynamic process can be followed for up to 24 hours, removing the need for multiple-sample imaging or repetitive venting of the SEM. There is no need for coating, drying or freezing of the samples. Simply place the sample in the capsule, seal it and image. The samples can be visualized directly using a BSE detector.

*The QX-202 capsules are intended for single use and are supplied in boxes of 24 and 48 units.*

| Cat. # | Description | Pack |
|---|---|---|
| **SK-202-24** | QX-202 Capsules | 24/pk |
| **SK-202-48** | QX-202 Capsules | 48/pk |

### *ACCESSORIES FOR THE QX-202 CAPSULES:*

#### MP-12 Multi-capsule Plate

The Multi-capsule Plate is designed to enable parallel handling of a number of individual QX-202 capsules. It serves for holding the capsules during specimen preparation, and for storage.

| Cat. # | Description | Pack |
|---|---|---|
| **MP-12** | MP-12 Multi-capsule Plate | 2/pk |

#### QX Imaging Buffer

QX Imaging Buffer is a solution optimized for imaging the Calibration Capsule in an SEM. It should be applied into the Calibration Capsule prior to SEM imaging. *The QX Imaging Buffer is supplied lyophilized.*

| Cat. # | Description | Pack |
|---|---|---|
| **IB-64** | QX-202 Imaging Buffer | each |

#### Calibration Capsule

The Calibration Capsule is a capsule that has been specially designed to assist first time users in finding optimal imaging conditions for WETSEM™ imaging in their SEM. The Calibration Capsule contains nanoparticles of two different sizes; 40 and 500 nm. The particles are easily visualized in an SEM and provide a convenient means to calibrate the parameters for optimal wet imaging conditions.

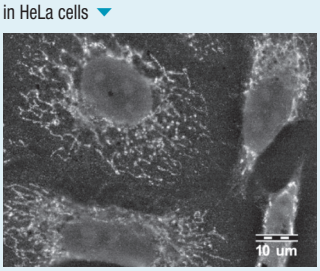
| Cat. # | Description | Pack |
|---|---|---|
| **RT-56** | QX-202 Calibration Capsule | each |

#### Applicator (Microman M25 and tips)

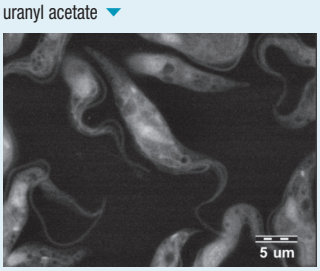
Gilson Microman® pipette is specially designed to accurately displace small quantities of viscous solutions and mixtures. Also supplied is a box of single-use capillaries and pistons which are used in conjunction with the Microman M25.

| Cat. # | Description | Pack |
|---|---|---|
| **MM-25** | Microman M25 and Tips | set |

Mitochondria gold-immunolabeled in HeLa cells

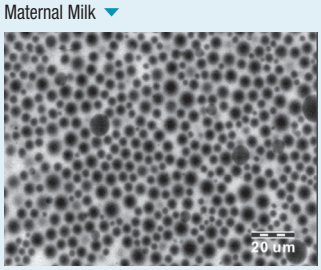



Trypanosoma brucei, uranyl acetate




NIH-3T3 cell, osmium tetroxide


Maternal Milk



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# Starter Kits

## Starter Kits for the QX-102 Capsules

### QX-102 Starter Kit

The SK-102-24 Starter Kit includes QX-102 Capsules and all the necessary accessories to get started with the QuantomiX WETSEM™ technology.

**The kit contains:**

- QX-102 Capsules (24 units)
- MP-10 Multi-well Plates (2 units)
- MA-4 Multi-well Aspirator
- QX Imaging Buffer
- RT-56 QX-102 Calibration Capsule
- User Manual, Applications Manual, Instructional Training Movie, Imaging Quick Guide

| Cat. # | Description | Pack |
|---|---|---|
| **SK-102-24** | QX-102 Starter Kit | each |

### QX-102 Starter Package (w/o aspirator)

The SP-102-24 Starter Package includes QX-102 Capsules and all the necessary accessories to get started with the QuantomiX WETSEM™ technology, when minimal liquid aspiration is required. It is recommended to add the Particle Imaging Kit to enhance particle imaging.

**The kit contains:**

- QX-102 Capsules (24 units)
- MP-10 Multi-well Plates (2 units)
- QX Imaging Buffer
- RT-56 QX-102 Calibration Capsule
- User Manual, Applications Manual, Instructional Training Movie, Imaging Quick Guide

| Cat. # | Description | Pack |
|---|---|---|
| **SP-102-24** | QX-102 Starter Package (w/o aspirator) | each |

### Q-102 Assessment Kit

**The kit contains:**

- QX-102-6 (6 capsules)
- MP-10-1 (1 Multi-well plate)
- AT-60 (24 Tips)
- IB-64
- RT-56

| Cat. # | Description | Pack |
|---|---|---|
| **SK-102-6** | Q-102 Assessment Kit | each |

## Starter Kits for the QX-202 Capsules

The SK-202-24 Starter Kit includes QX-202 Capsules and all the accessories necessary to get started with the QuantomiX WETSEM™ technology.

**The kit contains:**

- QX-202 Capsules (24 units) for the -24 and 48 capsules for the -48
- MP-12 Multi-well Plates (2 units)
- IB-64 QX Imaging Buffer
- RT-56 QX Calibration Capsule
- Calibration Capsule Insert
- MicroMan Pippetor
- M-25 Tips
- M-25 Plungers
- User Manual, Training CD, Imaging Quick Guide

| Cat. # | Description | Pack |
|---|---|---|
| **SP-202-24** | QX-202 Starter Kit | 24/pk |
| **SP-202-48** | QX-202 Starter Kit | 48/pk |

## Starter Kits for the QX-302 Capsules

### SK-302-12 Starter Kit

The SK-302-12 Starter Kit includes QX-302 Capsules and all the necessary accessories to get started with the QuantomiX WETSEM™ technology.

**The kit contains:**

- QX-302 Capsules (12 units)
- MP-12 Multi-capsule Plates (2 units)
- QX-302 Imaging Buffer
- QX-302 Calibration Capsule
- User Manual, Graphic User Guide, WETSEM™ Imaging Quick Guide

| Cat. # | Description | Pack |
|---|---|---|
| **SK-302-12** | QX-302 Starter Kit | each |

### SK -302 Assessment Kit

**The kit contains:**

- 3 QX-302 Capsules
- MP-12 Capsule Plate (1)
- IB-74 Imaging Buffer (1)
- RT-58 Calibration Capsule (1)

| Cat. # | Description | Pack |
|---|---|---|
| **SK-302-3** | Assessment Kit | each |

## Starter Kits for the QX-302 and QX-102 Capsules

The SK-102-302 Starter Kit includes QX-102 Capsules and QX-302 Capsules, and all the necessary accessories to get started with the QuantomiX WETSEM™ technology for all types of samples.

**The kit contains:**

- QX-102 Capsules (12 units)
- QX-302 Capsules (6 units)
- MP-10 Multi-well Plates (2 units)
- MP-12 Multi-capsule Plates (2 units)
- MA-4 Multi-well Aspirator
- QX Imaging Buffer
- QX-302 Imaging Buffer
- QX-102 Calibration Capsule
- User Manuals, Applications Manual, Instructional Training Movie, Graphic User Guide, WETSEM™ Imaging Quick Guide

| Cat. # | Description | Pack |
|---|---|---|
| **SK-102-302** | QX-102 & QX-302 Combined Starter Kit | each |

# SEM SUPPLIES

## FlowVIEW Aquarius

*Creating a liquid environment in SEM*

### OVERVIEW

Aquarius is the pioneer of using e-beam to test original fluids and liquid samples. Aquarius can test and monitor coating materials in their original form, especially the liquid state.

The functions of the chip and liquid sample holder are versatile (disposable version for slurry testing, inline version for process monitoring, quick assembly version for electrode testing) and high-resolution inspection simultaneously.

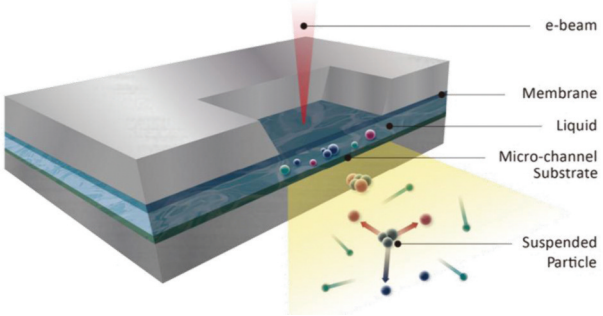
The system is capable of displaying the images of sample in its liquid state under original conditions and providing analysis results such as particle size distribution, dispersity, uniformity, concentration, shape and composition required for R&D and production.

The liquid sample holder in the MFC system is compatible with different preparation tools (such as powder disperser for powder size distribution analysis, centrifuge for bio-sample morphology observation and membrane filter for liquid defect identification) for static inspection in various applications. The sample in the holder can be transferred to different inspection platforms to obtain the correlative information and make versatile and in-depth analysis of the sample possible.

### SCIENTIFIC PRINCIPLES

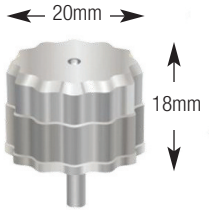
#### Ultra-Thin Sample Adaptive Chips

Produced using the semi-conductor manufacturing process together with surface treatment, the membrane can be made hydrophobic, hydrophilic or bifunctional linkers for different applications, allowing samples under test to automatically adhere to the observation window for best image resolution. To ensure image quality, the membrane thickness is designed to be less than 30 nm, yet it is made robust by adjusting the window size and shape to withstand the pressure difference between the vacuum and atmosphere.




#### Liquid Sample Holder

Combing with microfluidics and high-precision pogo pin with leak-free sealing design, the liquid sample holder is capable of controlling and monitoring the micro-environment. The microfluidics designs were optimized by Computational Fluid Dynamics (CFD) simulations to achieve the best transportation model for the samples. The liquid sample holder has special mechanical design to boost the operation efficiency and can finish the sample loading within a minute. The electrical charging/discharging can also be transmitted to the control system and inside the microfluidics via pogo pin design. Additionally, the heat exchange fluid can be circulated in one of the flow channels, thereby accomplishing the functions of temperature control and fluid properties monitoring, allowing nano-scale in-situ testing of the samples under their original activity.




**The FlowVIEW Aquarius Starter Kit contains:**

- **(12) Microscopic Fluid Chips**
- **(12) Micro-Channel Substrate**
- **(10) Tips, (1) Adapter, (1) O-Ring, (1) Gasket**
- **Pipette**
- **Tweezer**
- **Acrylic Case with Holder**

### FEATURES

**Simple —** The liquid sample holder has special mechanical design to boost the operation efficiency and can finish the sample loading within 0.5 minute.

**High Resolution —** Objects smaller than 10 nm can be easily observed

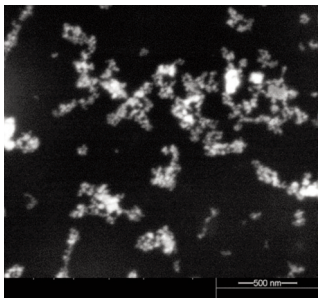
**High Compatibility —** Highly compatible with various models ( FEI JEOL Hitachi ZEISS Phenom TSCAN TEMIC … ) It can be a shuttle to an Optical Microscope/Fluorescence Microscope for in-situ observation

**Customized —** It can be placed with the silicon wafer & biochip substrate for in-situ observation.

### PERFORMANCE

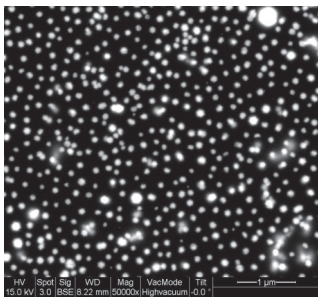
Aquarius is the pioneer of using e-beam to test original fluids and liquid samples. Aquarius can test and monitor coating materials in their original form, especially the liquid state.

**Dry**



Aggregation after dry-out

**Wet**



Liquid sample in original state

### ORDERING INFORMATION

***To place an order or for more information, please contact us.***



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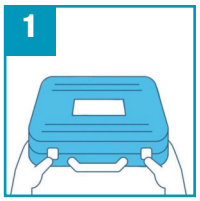
## FlowVIEW Aquarius (continued)

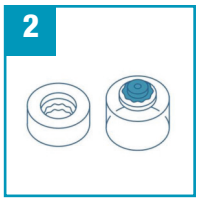
### HOW TO USE...

**IMPORTANT:**

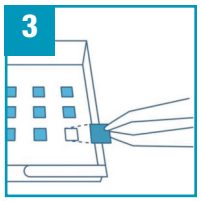
**1.** Please don't blow on the Microscopic Fluid Chip.
**2.** Do not drop the Microscopic Fluid Chip.
**3.** Drop liquid sample below 5uL



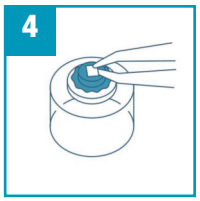
Open up starter kit.



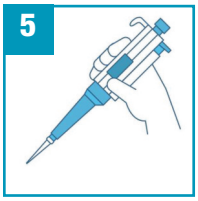
Take out acrylic case equipped with holder.



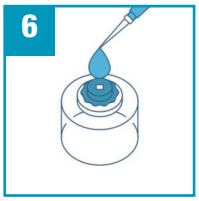
Take out chip with tweezers.



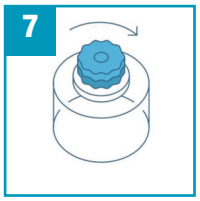
Put chip onto center of holder and align the chip with tangent line.



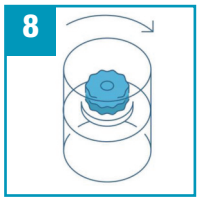
Take out pipette and install tip.



Draw up liquid sample onto the center of the chip (5uL at a time).

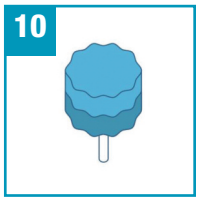


Cover holder with lid and twist slightly.



Twist acrylic case to fit holder. Make sure upper and lower lines align.

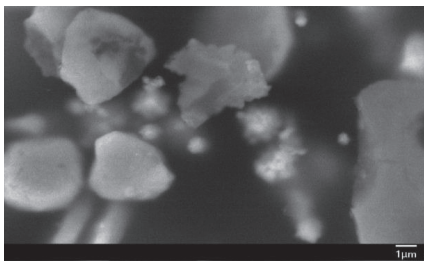
Assemble adapter.

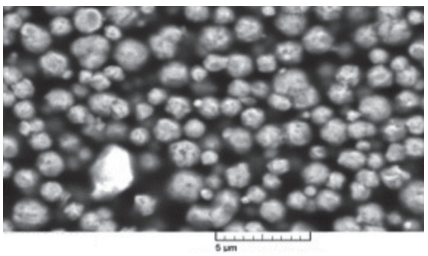


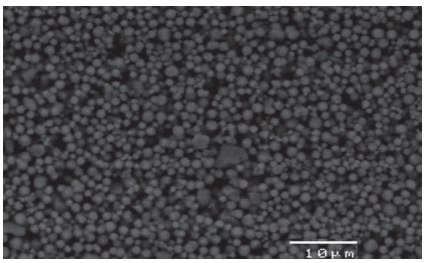
Finished!

## APPLICATIONS

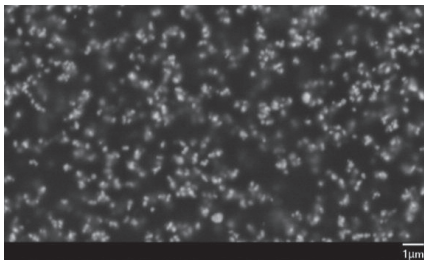
### Energy

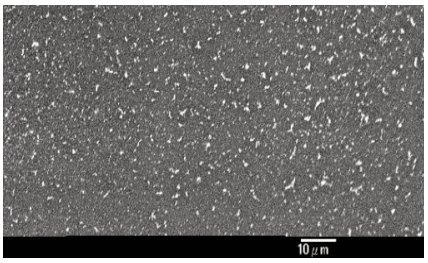

Copper Paste

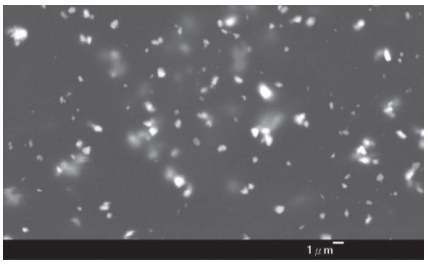

Aluminum


Silver

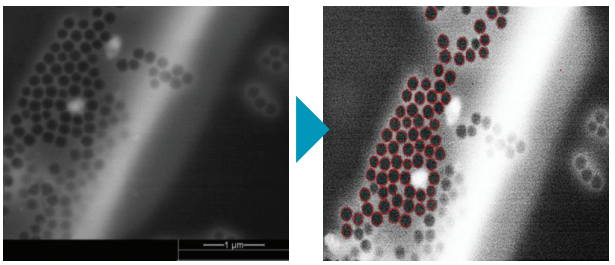
### Semiconductors & Electronics


Chemical Mechanical Polishing Slurry

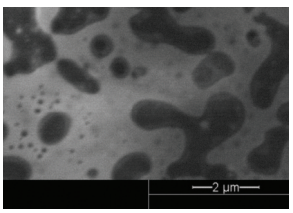

Metal Plating


Paint & Coating Material

### Polystyrene Manufacturing



Well produced Polystyrene manufacturing process


Incorrect Polystyrene manufacturing process (Polystyrene can't form a sphere)

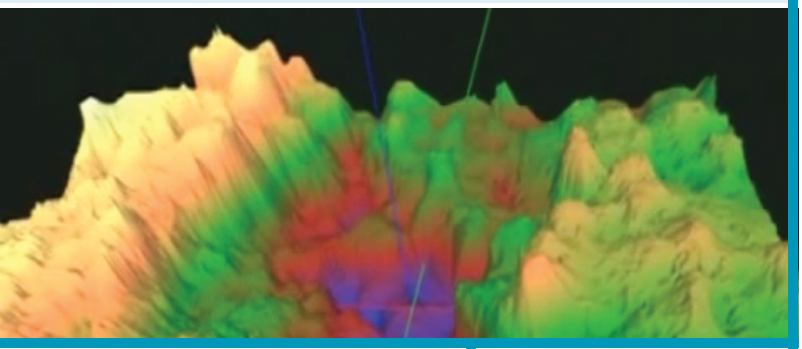
## SEM SUPPLIES

# MeX 6.1 is now available

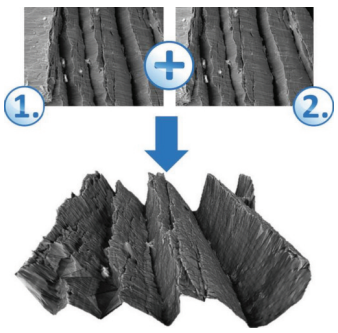
*Featuring redesigned measurement modules for higher usability.*

MeX 6.1 supports Windows 8 and comes in both 32bit and 64bit versions. MeX 6.1 is the recent software upgrade with new features for extended measurements. The latest technologies for applications in micro-coordinate measurement make any SEM into a comprehensive metrology tool that opens up new fields of use:

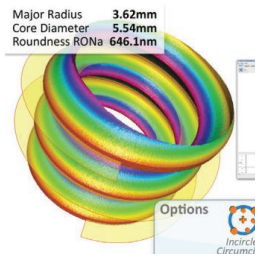
- **Undercuts and larger field of views now measurable**
- **New features such as form fitting functionalities available**
- **Redesigned measurement modules provide higher usability**



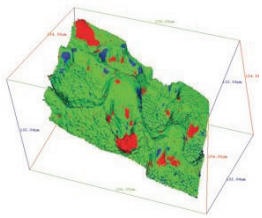
*MeX 6.1 automatically retrieves 3D information using stereoscopic images*



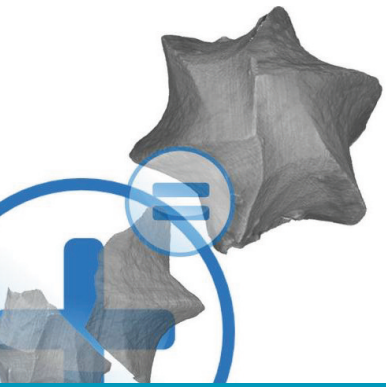

*MeX 6.1 measures distances, angles, circles, thread pitch etc.*



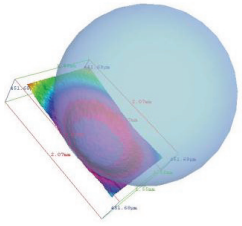

*MeX 6.1 compares two different geometries.*



*MeX 6.1 automatically merges single measurements into a complete 3D data set.*



*MeX 6.1 also includes form fitting functions.*



## MeX — 3D Surface Metrology for SEM

*MeX turns any SEM into a measurement device*

MeX is a stand alone software package that turns any scanning electron microscope (SEM) with digital imaging into a true surface metrology device. Using stereoscopic images the software automatically retrieves 3D information and presents a highly accurate, robust and dense 3D dataset which is then used to perform traceable metrology examination. The results are obtained irrespective of the SEM magnification providing metrology at macro and micro levels...

The software is self installing and is extremely easy to use. The modular design of the package allows flexibility in use; it also permits users, with a single repetitive task to perform, to purchase modules according to requirements. The analysis modules allow measurement of profile, roughness, area, volume and height. All measurements are traceable, can be calibrated and conform to ISO standards.

The performance of MeX has been proved by many customers in leading companies and universities throughout the world providing imaging and analysis previously unobtainable with SEM images.

### Mex Features

**Robust and highly accurate at any magnification**

The core of MeX is formed by its innovative 3D reconstruction algorithms. The research and development team of Alicona Imaging have invented methods that generate highly accurate, dense and robust results. This unique performance becomes obvious in images of complex structures with steep edges and drop offs in addition to demanding samples with low texture and signal-to-noise-ratio. This high quality is achieved irrespective of image magnification.

**Automatic measurement yields automatic calibration**

Conventional approaches rely on the use of two images. This comes with the major drawback that the overall accuracy of the 3D measurement is partly dependent on the accurate reading of the tilt angle. It is also commonly known that this reading maybe error-prone and can only be achieved to a certain level of accuracy. Latest developments of Alicona have extended this stereoscopic approach to a third image. As a result the user defined parameters, such as the tilt angle, are automatically calculated. This omits the influence of the user and allows, for the first time, traceable 3D measurement in the SEM.

### Easy to use, easy to install

No additional hardware is necessary to run MeX. As a pure software solution MeX can be operated with any SEM requiring only images in common formats. The software is self-installing and works completely independently of any third party drivers or components. The user interface of the overall package is very user friendly and self-explanatory. Data is obtained quickly and effectively. A wizard guides the user through the reconstruction process which then automatically converts the information to a 3D data set. The consecutive analysis is again intuitive and the user is not confronted with unnecessary functionality. The user finds exactly what is expected from a 3D metrology package.

### Comprehensive depth analysis

The uniqueness of MeX is in its accuracy and robustness. But in order to perform appropriate measurements, beyond conventional visualization, analysis following international standards must be available. In MeX, the easy to use, roughness and area analysis are provided to EN/ISO standards. Measurements are performed directly on the SEM image. Printing and exporting the actual representations of an image are a one-click operation.



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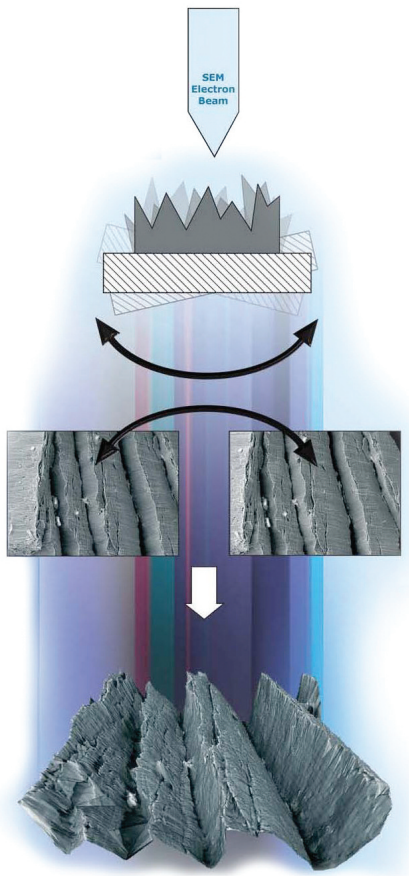
## MeX – 3D Surface Metrology for SEM (continued)

The visual link between the surface and the image enable precise and flexible measurements. Even volumetric analysis is conveniently feasible. Therefore MeX is the only software package that turns a SEM into a true 3D metrology device.

**How does Mex work?**

The image formation process in the SEM is based on perspective projection. Similar to a conventional light microscope the three dimensional object is projected onto a two dimensional image plane and information about the third dimension is lost. Note, the large depth of focus in SEM provides full depth of focus images, but does not allow to measure depth. Only two dimensional measurements in the image plane are feasible.

An eucentric tilting of the stage, meaning that the intersection of the primary electron beam with the specimen define the centre of tilting, yield a second image of the specimen observed form a different viewpoint. A so called stereoscopic image is generated. Overlay techniques such as red-green coloring provide anaglyph viewing and thus depth perception but again no quantitative analysis. The leading technology of Alicona now automatically identifies points in each of the images that belong to the same point on the specimen. From theses so called homologous points the true three dimensional coordinates of the observed point can be recovered. This demanding task is robustly solved for each pixel in each of the images and thus a dense 3D model of the specimen is obtained. An additional third image captured from a third tilt position allows to automatically refine given calibration data. Thus traceable results are obtained.




### Automatic Calibration

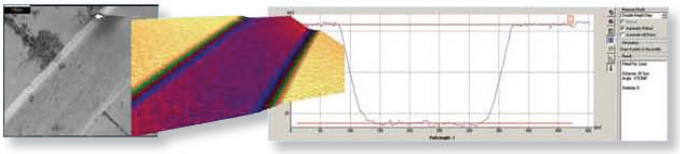
**Verification of measurements through height step**

Height measurements with the AutoCalibration can be verified using a micro-contour-artifact that is calibrated by the PTB (Physikalisch Technische Bundesanstalt, Braunschweig). The depth measurement standard from the PTB contains grooves of different depth (from 240nm to 50µm).

*Micro- contour-artifact, calibrated by PTB*

- **The unique AutoCalibration works fully automatically. Alicona is the only supplier able to offer this technology.**
- **MeX is the only real metrology package that allows numerically accurate measurements independent on the magnification.**
- **MeX allows extended analysis features such as ISO conform roughness analysis and extended form analysis.**

***Reconstructions And Analysis In The SEM***



*Input image, 3D reconstruction and height measurement with the AutoCalibrator. The AutoCalibrator refines the calibration data and allows more accurate measurements.*

| Measurement results in comparison | | |
|---|---|---|
| PTB | Stereo Creator | AutoCalib |
| 24.04µm ±0.07µm | 25.3µm | 24.10µm |

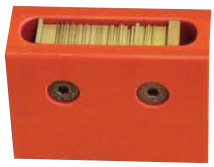
| Angle refinement with AutoCalibration | | |
|---|---|---|
| Stereo Creator | -9,5° | 9,5° |
| AutoCalib | -10,05° | 10,00° |

**Verification of measurements through radius measurement**

Measurements of the pure software solution MeX can be verified using a micro-contour-artifact that is calibrated by the PTB (Physikalisch Technische Bundesanstalt, Braunschweig). The artifact contains different regions including steep flanks, height steps and cylindrical elements.

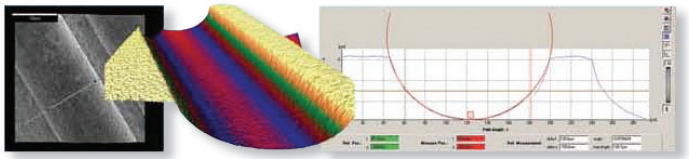
The following measurements can be verified:

- **Circle measurements**
- **Steep flanks**
- **Depth measurements**



*PTB calibrated micro artifact with steep flanks, height steps and cylindrical elements.*

***Reconstructions And Analysis In The SEM***



*Verification of circle measurements. One of the input images (SEM) obtained from the region with the cylindrical valleys. The radius of the circle was measured with MeX – AutoCalibration.*

| Measurement results in comparison | | |
|---|---|---|
| PTB | Stereo Creator | AutoCalib |
| 80µm ± 2µm | 75.11µm | 81,14µm |

| Angle refinement with AutoCalibration | | |
|---|---|---|
| Stereo Creator | -10° | 10° |
| AutoCalib | -10,86° | 11.01° |

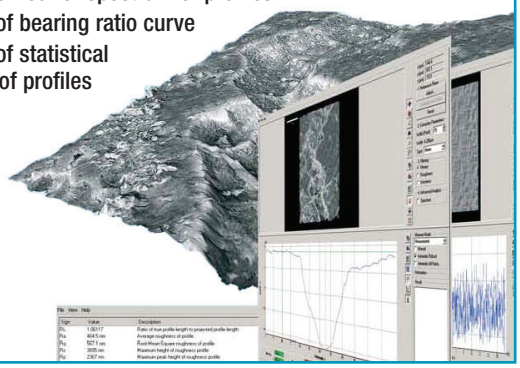
# SEM SUPPLIES

## MeX — 3D Surface Metrology for SEM (continued)

### Height & Roughness Analysis

Profile measurement enables virtual cutting of specimen. The user defines a path on the optical image and receives the corresponding 3D profile. Roughness and contour measurements conform to recognized EN ISO 4287/4288 international standards. The profile analysis also allows the fitting of primitives such as circles, angles or others. Further, manual and semi automatic measurement possibilities are provided.

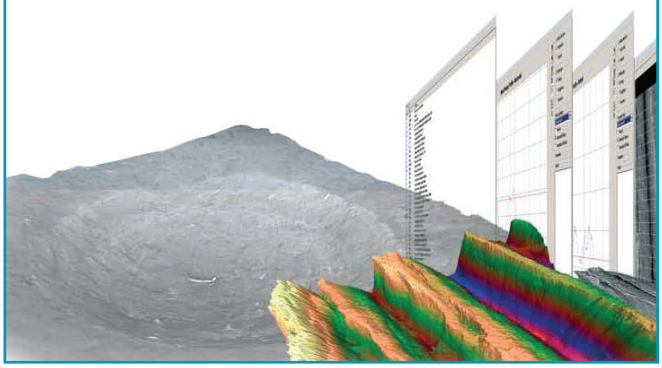
- Profile extraction with different width
- Filtering of the profile with selectable Lc value with ISO 4288 conformity information
- Manual cursor measurement
- Automatic measurements of lines, parallel lines, single height steps, double height steps, ISO 5436 conform height steps, angles, 2 line angles and circles
- ISO 4287 conform calculation of the following primary parameters: Pa, Pq, Pz, Pp, Pv, Pc, PSm, Psk, Pku, Pdk
- ISO 4287 and ISO 11562 conform calculation of the following roughness parameters: Ra, Rq, Rz, Rp, Rv, Rc, RSm, Rsk, Rku, Rdk
- ISO 4287 conform calculation of the following waviness parameters:Wa, Wq, Wz, Wp, Wv, Wc, WSm, Wsk, Wku, Wdk
- Calculation of fourier spectrum of profiles
- Calculation of bearing ratio curve
- Calculation of statistical parameters of profiles



### Area Analysis

Area analysis provides the determination of Ra, Rq and Rz. Parameters like roughness, waviness and the fractal dimension of user defined surface patches are achieved. The user defines a region of interest such as a rectangle or polygon and MeX automatically calculates the values. For the visual representation of the surface a grey scale or pseudo colored depth map can be used. It is also possible to display ISO-lines to highlight depth variations.

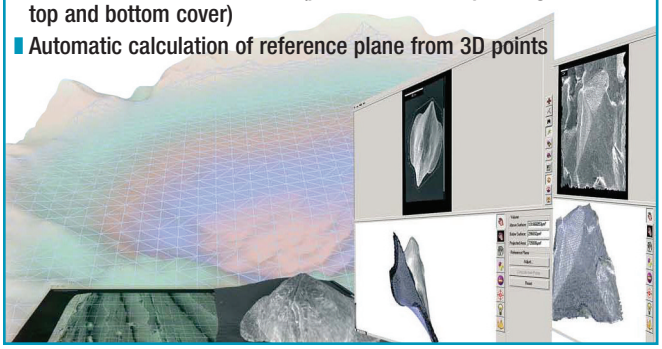
- Calculation of surface parameters like Sa, Sq, Sz, Sp, Sv
- Calculation of fractal dimension
- Extraction of horizontal and vertical profiles
- Filtering of profiles
- Calculation of mean of the primary, roughness and waviness values of the horizontal and vertical profile
- Calculation of the primary, roughness and waviness parameter of the mean horizontal and vertical profile
- Calculation of bearing ratio curve
- Calculation of bearing area curve



### Volume Analysis

Volume analysis calculates the volume of voids and protrusions. The measurement area is defined directly on the optical image. The volume is determined throughout the computation of a soap film model. For the 3D boundary of the selected area MeX calculates a covering surface that behaves like a soap film.

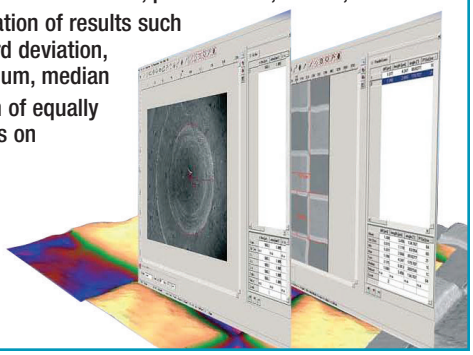
- Selectable area for volume measurement
- Selectable reference surface (plane, minimum spanning surface, top and bottom cover)
- Automatic calculation of reference plane from 3D points



### 2D Image Analysis

2D image analysis allows the performance of manual and semi automatic measurement of simple primitives. Also, the ability to write on the images as well as saving measurement results in a comprehensive and easy to use database is provided.

- Manual measurement of lines, parallel lines, arcs, circles, ellipses, polygons, polylines, freehand, marker
- Automatic measurement of lines, parallel lines, circles, arcs
- Statistical calculation of results such as mean, standard deviation, minimum, maximum, median
- Automatic search of equally shaped structures on the image





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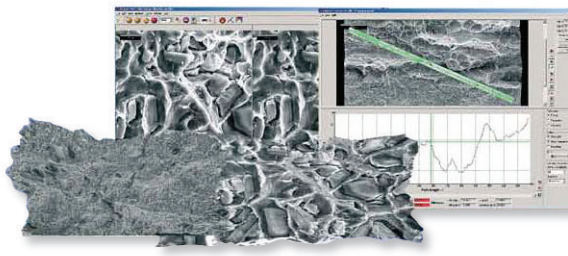
## MeX — 3D Surface Metrology for SEM (continued)

### Fracture Analysis



Quantitative surface analysis with the SEM is often used to investigate damage evolution in materials in addition to assisting in the design of more fracture resistant materials. The optimization of materials is complicated by the fact that the material properties may need to vary locally within the component. An example of this is cutting tools that need to be very hard at the cutting edge but be tough in the interior of the material. MeX is used to study deformation and fracture behavior to optimize the performance of inhomogeneous materials. Dense, robust and accurate 3D reconstructions are created to allow measurement of fracture surface profiles, roughness parameters and fractal dimensions.

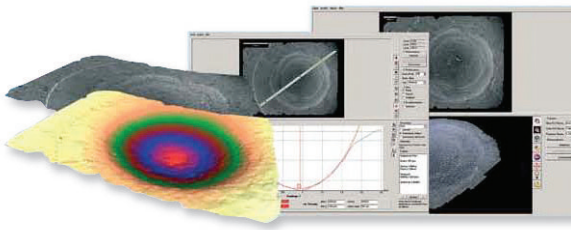
3D measurement results computed by MeX lead to significant understanding of parameters such as fracture toughness, crack growth and propagation or fracture resistance.

### Steel Production

Modern high-tech steel is one of today's´ most important materials in all kinds of industries, transportation or medicine. The surface characteristics can relate to appearance, conductivity, corrosion resistance, wear or many other properties. MeX is an essential tool to assist with surface characterization for quality assurance and failure analysis. The 3D measurement capabilities provide robust and accurate results on properties such as fracture and compression strength, notch bar impact value or creep strength.

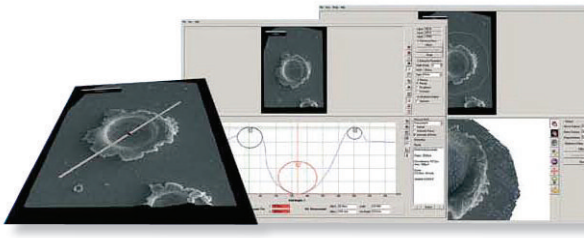
MeX is also used to evaluate faults in steel production. The overall quality of steel is dependent on the topography of the roller used in its production. As soon as the roller exhibits any kind of surface defects the surface of the steel will show dimples and inclusions. Using the measurement capabilities of MeX these faults can be analysed and the source of the defect traced.

### Forensic Studies



Every gun leaves distinctive marks and traces on the bullet cartridge and projectile, similar to fingerprints. These traces on a gun, found at a crime scene, can be instrumental to prove guilt of suspects. Conventional methods are based on the analysis of 2D images to identify which bullet has been fired from which weapon. However, the 3D visualization and measurement of the firing pin and cartridge indentation is far more precise. It is here that MeX offers unique capabilities providing a highly accurate, dense and robust 3D reconstruction with full depth of focus taken over a large field of view. Using MeX a user can, for example, measure the volume of a firing pin impression along with profile that can be related directly to the firing pin. This leads to a numerical evaluation independent from any subjective point of view, providing rapid and understandable analytical data for interpretation.

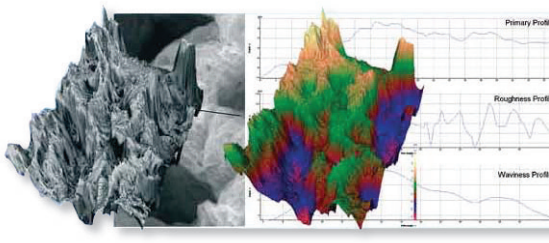
### Crater Shape Measurement



MeX can be used for the measurement of diameters, depths, angles of slope and volumes of craters created by impact of mineral grains on metals. This is part of the calibration work that has been done to help interpret cometary dust impacts on the stardust spacecraft, which returned to earth recently, carrying the first comet samples ever collected.

MeX has been used as a measurement tool to interpret the size, density and composition of particles responsible for making micrometer-scale craters. The ease of use of MeX, with its intuitive graphical interface, has enabled the quick and simple measurement of the required parameters. Data input and the range of easily interpreted reconstructions make MeX to a most suitable tool for quantified reconstruction of crater shapes from tilted stereo-pair electron micrographs.

### Cancer Research



Until MeX, the biological user has had limited methods that could provide accurate and robust measurements of surface texture, volumes and area of bulky irregular samples. In recent research MeX has been used to characterize the topography of the extracellular matrix (ECM) underlying colon cancer cells at various stages. Also, the enhanced visualization and roughness measurement capabilities of MeX has provided additional information, not previously available, about the cancers´ behavior. These findings have implications not only for improving the general understanding how colon cancer and metastasizes grow, but, also lead to a better understanding of the role of the ECM topography in cancer.

# SEM SUPPLIES

## MeX — 3D Surface Metrology for SEM (continued)

### Sample Image Requirements

Mex is a very easy to use package for the creation of 3D images for subsequent measurement with the SEM. The software will do nothing to correct faulty images nor will it allow you to see features that are not on the sample. But by following a few simple procedures the results will be both spectacular and contain significant data, these simple procedures are shown below.

1) **All images must be in TIFF or BMP format**
2) **The magnification chosen must reflect the size of the features to be viewed; the software will not allow features to be measured that are not visible.**
3) **Tilt Angle: Mex will take either 2 or 3 images and these are divided by tilt angle, the choice of 2 or 3 images is specimen dependent. In the first case please supply a pair of images which have a differential tilt angle of 5 degrees.**
4) **Eucentric Tilt: Please ensure that the images are eucentric, this means that a single chosen spot on the image should be in the same position on each image (see note)**
5) **Tilt Direction: Please ensure that the tilt direction, when viewed on the SEM screen runs East to West and not North South or diagonal. If images run at an angle this will result in image rotation which will reduce the size of the image that can be viewed.**
6) **Working Distance. To construct the image we need to know the working distance**
7) **Calibration: Please ensure that a scale bar is on the image.**

**Note:**
To take images for MeX it is necessary to have Eucentric Images, it is not necessary to have a Eucentric Stage to take Eucentric Images. What is also important is that when tilt is applied the image moves east to west (or west to east) and not north to south or any diagonal from that.

A simple method without a Eucentric Stage is

1) Find and identify a feature on the image that can be used as a reference
2) Either turn on the cross wires built into the SEM or stick a corner of a post it note on the feature
3) Decide which magnification the image is to be taken at, then go 2 magnification steps above that and align the feature
4) Drop the magnification down and take the image
5) Reduce magnification to a level where the bulk of the feature is still visible (this makes it easier to track when tilt is applied)
5) Apply tilt bringing the feature back into the frame with X or and Y
6) Either turn on the cross wires built into the SEM or stick a corner of a post it note on the feature
7) Then go 2 magnification steps above the magnification selected in #3 and align the same feature
8) Drop the magnification down and take the second image

If a third image is required simply repeat the process

### Ordering Information

| Cat# | Product Name | Qty. |
|---|---|---|
| **Packages** | | |
| **MP-0101** | MeX-Standard | Package |
| *MeX-Database, MeX-3DViewer, MeX-Creator, MeX-AutoCalibration, MeX-Profile, MeX-Area, MeX-Volume, MeX-SCS for one year* | | |
| **MP-0102** | MeX-Professional | Package |
| *All available MeX modules: MeX-Database, MeX-3DViewer, MeX-Creator, MeX-AutoCalibration, MeX-Profile MeX-Area, MeX-Volume, MeX-StereoComparator, MeX-3DReader inclusive two years of e-mail support and free updates* | | |
| **Modules** | | |
| **MM-0109** | MeX-3DReader | each |
| *Importing 3D datasets obtained from other devices such as AFM (ask for supported machines and formats)* | | |
| **MM-0104** | MeX-3DViewer | each |
| *Visualizing generated 3D-data in an intuitive, easy-to-use viewer* | | |
| **MM-0106** | MeX-Area | each |
| *Area analysis including roughness measurements* | | |
| **MM-0103** | MeX-AutoCalibration | each |
| *Extension to MeX-Creator - using three images, calibration data are refined and a much higher accuracy is achieved* | | |
| **MM-0102** | MeX-Creator | each |
| *Automatic surface measurement from stereoscopic images — the core module of MeX (requires MeX-Database and MeX-3DViewer)* | | |
| **MM-0101** | MeX-Database | each |
| *Graphical database for storing and maintaining the captured stereoscopic images* | | |
| **MM-0105** | MeX-Profile | each |
| *Profile extraction, visualization and analysis including EN/ISO roughness and waviness measurements* | | |
| **MM-0108** | MeX-StereoComparator | each |
| *Manual pointwise 3D measurement for stereoscopic images* | | |
| **MM-0107** | MeX-Volume | each |
| *Volume extraction, visualization and analysis* | | |
| **Options** | | |
| **MA-0101** | MeX-FloatingLicence | each |
| *Dongle to allow network version of MeX: provides the use of MeX in a local network with only one dongle* | | |
| **Service & Support** | | |
| **MS-0104** | MeX-Installation | each |
| *Shipping, installation and training for one day at your location (excl. travel expenses and accommodation).* | | |
| **MS-0103** | MeX-OfflineReconstruction | each |
| *Measurement of your specimen in our lab, including a CD with results and demo version* | | |
| **MS-0102** | MeX-OnlineReconstruction | each |
| *Measurement of your stereoscopic images; the result can be viewed and analyzed by MeX-Demo* | | |
| **MS-0101** | MeX-SCS ServiceContractSoftware | each |
| *One year of e-mail support and free updates; continuous MeX-ServiceContractSoftware required for upgrades/updates* | | |
| **MS-200** | MeX 6.1 Professional Upgrade | each |
| *An upgrade to MeX Professional Module (for service contracts that have expired within 1 year).* | | |
| **MS-250** | MeX 6.1 Professional Upgrade | each |
| *An upgrade to MeX Professional Module (for service contracts that have expired over 1 year).* | | |
| **MS-0106** | MeX-Installation&TrainingContinued | each |
| *Installation and adoption training for one additional day at your location. Travel- and accommodation costs are excluded.* | | |
| **Tools** | | |
| **IA-0110** | IF-VerificationTool | each |
| *PTB-certified micro contour standard for verification of InfiniteFocus* | | |



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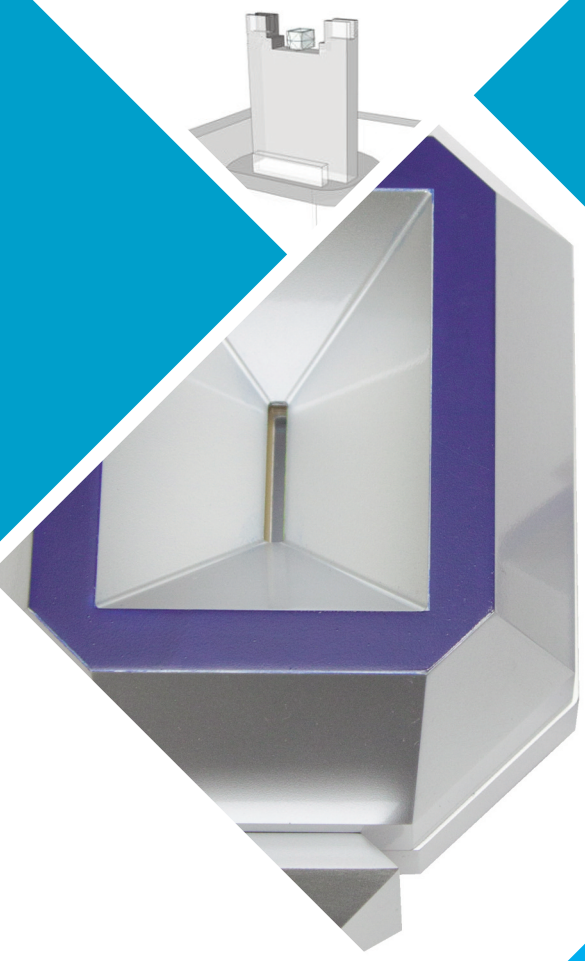
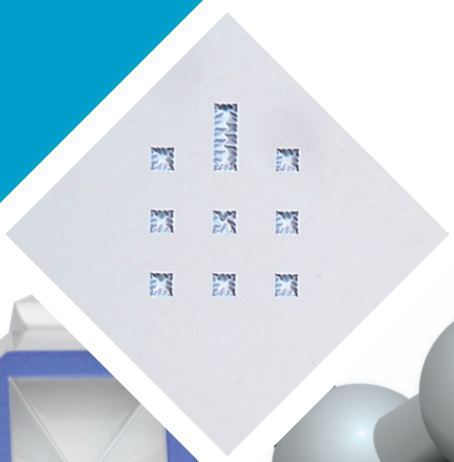
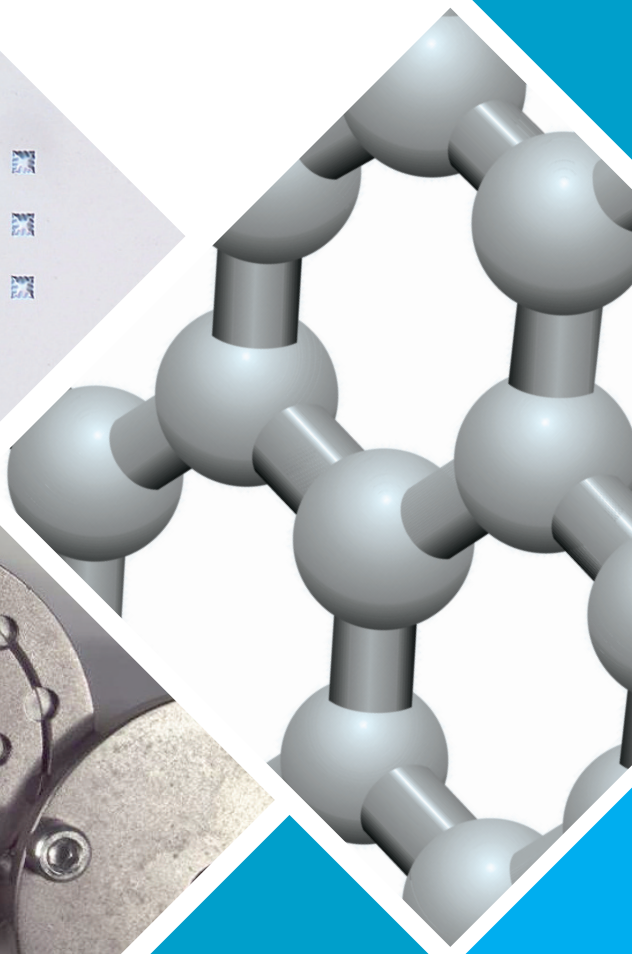
# TEM SUPPLIES

**TEM WINDOW GRIDS,** X-RAY WINDOW GRIDS, **WET "LIQUID" TEM KIT,** TEM GRID HOLDERS & TOOLS, **SAMPLESAVER™,** GRAPHENE SUPPORT FILMS FOR TEM







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# TEM SUPPLIES

## Choosing a TEM Window Grid

| | Amorphous Silicon | Porous Nanocrystalline Silicon | Silicon Dioxide | Silicon Nitride | Standard Carbon | Ultrathin Carbon |
|---|---|---|---|---|---|---|
| **Actual Thickness (nm)** | 5, 9, 15 | 15 | 20 & 40 | 5, 10, 20, 50 | 20-50 | ~10 |
| **Image Quality** | Excellent | Good | Ok | Good | Ok | Good |
| **Plasma Cleanable** | Yes | Yes | Yes | Yes | No | No |
| **Elemental Analysis Background** | Si Only | Si Only | Si, O | Si, N | C, H | C, H |
| **Thermal Stability** | ~600C | >1000C | >1000C | >1000C | ~400C | ~400C |
| **Chemical Stability** | Avoid Strong Bases | Avoid Strong Bases | Good | Excellent | Good | Good |
| **Tolerates High Beam Currents** | Excellent | Excellent | Ok | Ok | Excellent | Excellent |
| **Potential Contamination Source** | None | None | None | None | Carbon | Carbon |
| **Open Nanoscale Pores** | No | Yes | No | No | No | No |
| **Background** | Featureless | Nanocrystalline | Featureless | Featureless | Featureless | Featureless |

## TEM Window Grid Membrane Strength

All our membrane types and membrane area configurations have been robustness tested by application of differential pressure. In these tests, the membrane was oriented such that differential pressure forced the membrane against the chip frame. In the opposite orientation where the membrane would be delaminated from the chip frame, the pressure tolerance would be several times lower.

All values below are the maximum tolerated differential pressure reported as mean +/- standard deviation (n = 3), in units of PSI.

**Window Sizes:**

**9 Windows:**
(8) 100x100, (1) 100x350 micron

**9 Small Windows:**
(8) 50x50, (1) 50x350 micron

**2 Slots:**
(2) 50x1500 micron

**Single Windows:**
(1) square window of x micron side-length

### Membrane Window Strength - Differential Pressure Tolerance

| Pure Silicon | Thickness 5 nm | 9 nm | 15 nm | 30 nm | 35 nm |
|---|---|---|---|---|---|
| 9 Windows | | 3.90 ± 0.71 | 11.57 ± 0.26 | | |
| 9 Small Windows | 2.30 ± 0.29 | | | | |
| 2 Slots | 2.60 ± 0.99 | 2.53 ± 0.40 | 14.73 ± 2.61 | | |
| Single 25 Micron | 35.33 ± 0.78 | | | | |
| Nanoporous - 9 Windows | | | | 16.47 ± 0.95 | |
| Nanoporous - Single 500 Micron | | | | 3.33 ± 0.17 | |
| Single Crystal - 9 Windows | | | | | 34.03 ± 1.07 |

| Silicon Nitride | Thickness 5 nm | 10 nm | 20 nm | 50 nm |
|---|---|---|---|---|
| 9 Windows | | 6.13 ± 2.00 | 40+ | 40+ |
| 9 Small Windows | 37.30 ± 3.08 | | | |
| 9 Large Windows | | 11.57 ± 0.66 | | |
| 2 Slots | 6.53 ± 0.24 | | | |
| Single 25 Micron | 40+ | | | |
| Single 100 Micron | | | | 25.13 ± 4.45 |
| Single 500 Micron | | | 9.90 ± 0.36 | 13.37± 1.25 |
| Single 1000 Micron | | | | 7.80 ± 0.29 |
| Microporous - Single 500 Micron | | | 5.37 ± 0.37 | 10.13 ± 0.52 |
| Nanoporous - Single 500 Micron | | | 5.33 ± 1.39 | |

| Silicon Dioxide | Thickness 20 nm | 40 nm | 75 nm |
|---|---|---|---|
| 9 Windows | 11.33 ± 0.37 | 12.73 ± 0.68 | |
| G-Flat™ Single 1000 Micron | | | 2.93 ± 0.17 |

| X-Ray Windows | Thickness 50 nm | 100 nm | 200 nm | 300 nm |
|---|---|---|---|---|
| Single 500 Micron | 20.47 ± 0.33 | 24.40 ± 0.99 | | |
| Single 1000 Micron | 9.67 ± 0.12 | 13.13 ± 0.09 | | |
| Single 1500 Micron | | | 6.97 ± 0.25 | |
| Single 2500 Micron | | | 4.07 ± 0.09 | |
| G-Flat™ Single 500 Micron | | 5.60 ± 0.29 | | 11.53 ± 0.12 |
| G-Flat™ Single 1000 Micron | | | 2.63 ± 0.05 | |



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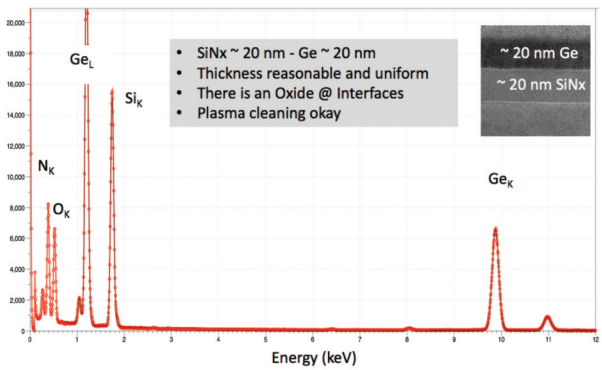
# EDX/XEDS Calibration TEM Window Grid

*Suspended germanium provides a unique calibration standard for x-ray energy dispersive spectroscopy*




Since Ge is not typically found in TEM columns, the calibration samples provide a material that cannot be mistaken for instrument components and their signal peaks. The regime in which system peaks normally occur [ 2-9 keV and 11-20 keV ] is devoid of peaks from the Ge.

The Ge is suspended across two micron pores that are patterned on a grid of 20 nm thick silicon nitride.

The single 500 x 500 micron window is compatible with high tilt angle tomography, since at 70 degrees of tilt, the thin and beveled 100 micron silicon frame allows you to use a ~50x50 micron region within the center of the window from any rotational orientation.

These EDX calibration standards were developed in partnership with Dr. Nestor J. Zaluzec from the Electron Microscopy Center and the Center for Nanoscale Materials at Argonne National Laboratory.

## APPLICATIONS

- **Detector energy axis and energy resolution calibration**
- **Detector Window Transmission Evaluation**
- **Detector solid angle measurements**
- **Electron optical instrument system peak measurements**
- **Specimen holder penumbra measurements**

## SPECIFICATIONS

20 nm thick germanium (Ge) coating on microporous 20 nm thick, low-stress silicon nitride (SiN)

Two micron pores on 1:1 pitch grid pattern

100 micron thick frame, fits 3 mm sample holders

(1) 500 x 500 micron window

## CITATIONS

Zaluzec NJ, DesOrmeaux JP, and Roussie J. A Ge/SiNx Standard for Evaluating the Performance of X-ray Detectors in the SEM, S/TEM and AEM. Microscopy and Microanalysis, 22(S3): 322-323.

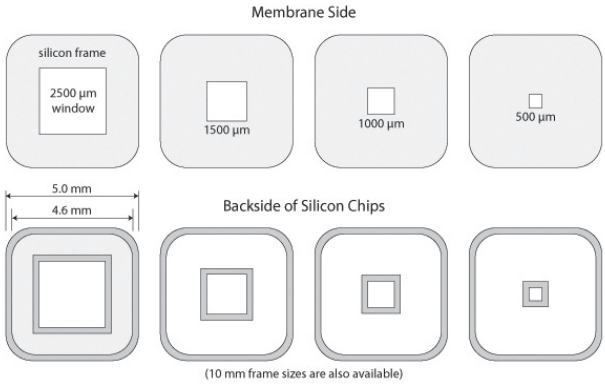
Zaluzec NJ, Wen J, Wang J, and Miller DJ. Quantitative Measurements of the Penumbra of XEDS Systems in an AEM. Microscopy and Microanalysis, 22(S3): 278-279.

## ORDERING

| Cat No. | Description | Qty. |
|---|---|---|
| **76042-01** | EDX-XEDS TEM Window Grid | 5/pk |

# X-Ray Windows, Square Frame

*X-Ray Windows - Ideal substrates for x-ray microscopy and x-ray spectroscopy techniques.*




State-of-the-art manufacturing and expert engineering allow for competitive prices of these windows. Made in the USA, these X-Ray windows are entirely plasma cleanable to remove organic contamination.

Flat, uniformly deposited films provide consistent backgrounds with low field-to-field variability and high x-ray transmission.

Available in two membrane types:

Silicon Nitride: Low-stress LPCVD Silicon Nitride membranes are mechanically strong and well-suited for high temperature and differential pressure environments

G-FLAT™ Silicon Oxide: Proprietary wrinkle-free G-FLAT™ Silicon Oxide membranes are well-suited for correlative optical and x-ray microscopy and analyses requiring a nitrogen-free background

These membranes are ideally suited for biological imaging studies, with a glass-like hydrophilic surface.

## ORDERING INFORMATION

### G-FLAT™ Silicon Oxide X-Ray Windows

- **310 micron thick frame**
- **Unique G-Flat™ wrinkle-free Silicon Oxide film**
- **Compatible with ultra-high vacuum (UHV) applications (300nm Membrane)**
- **Non-Porous**

| Cat. No. | Description | Window (Dim Sq.) | Membrane (Thickness) | Qty. |
|---|---|---|---|---|
| **76042-10** | G-FLAT™ SiO X-Ray Window | 500µm | 100nm | 20/pk |
| **76042-11** | G-FLAT™ SiO X-Ray Window | 500µm | 300nm | 20/pk |

### Silicon Nitride X-Ray Windows

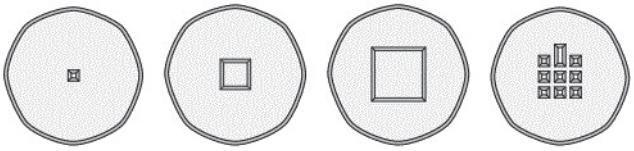
- **320 micron thick frame**
- **LPCVD silicon nitride film**
- **Low-Stress ~200 MPa**
- **Non-Porous**

| Cat. No. | Description | Window (Dim Sq.) | Membrane (Thickness) | Qty. |
|---|---|---|---|---|
| **76042-12** | Silicon Nitride X-Ray Window | 500µm | 50nm | 20/pk |
| **76042-13** | Silicon Nitride X-Ray Window | 1000µm | 50nm | 20/pk |
| **76042-14** | Silicon Nitride X-Ray Window | 500µm | 100nm | 20/pk |
| **76042-15** | Silicon Nitride X-Ray Window | 1000µm | 100nm | 20/pk |
| **76042-16** | Silicon Nitride X-Ray Window | 1500µm | 200nm | 20/pk |
| **76042-17** | Silicon Nitride X-Ray Window | 2500µm | 200nm | 20/pk |

# TEM SUPPLIES

## Silicon Nitride TEM Window Grids

*Silicon Nitride TEM Window Grids perform well under harsh lab conditions.*



Silicon frames are 100µm thick. Grids fit standard 3mm holders and most double tilt holders. They come in clear gel-boxes for simpler sample preparation.

### FEATURES

- **Plasma Cleanable —** can be vigorously plasma cleaned to remove organic contamination
- **Field to Field Uniformity —** Less than 0.5 nm variation in film thickness across an entire production log, not just a single window grid
- **Tolerates temperatures above 1000°C —** Supports use in environmental TEMs where dynamic processes are observed at high temperatures
- **Withstands Harsh Conditions —** Provides an ideal balance of imaging resolution, chemical stability and mechanical strength
- **Incorporates LPCVD, low-stress (~250MPa), non-stoichiometric silicon nitride —** Provides flat, insulating and hydrophobic surfaces

### RECOMMENDED USE

| | | |
|---|---|---|
| **High Resolution Imaging:** | 5nm | **76042-43**, 1 square (25x25µm)<br>**76042-44**, 9 squares (50x50µm)<br>**76042-45**, 2 slots (50x1500µm)* |
| **Robust, Increased High Resolution:** | 10nm | **76042-46**, 9 squares (100x100µm) |
| **Everyday Imaging:** | 20nm | **76042-49**, 1 square (500x500µm)<br>**76042-50**, 9 squares (100x100µm) |
| **Demanding Conditions:** | 50nm | **76042-53**, 1 square (100x100µm)<br>**76042-52**, 1 square (500x500µm)<br>**76042-51**, 1 square (1000x1000µm)<br>**76042-50**, 9 squares (100x100µm) |
| **Materials & Cryo-EM Suspension:** | Microporous | **76042-41**, 1 square (500x500µm)<br>**76042-40**, 1 square (500x500µm) |

*Coated with 1 nm of ultrahigh purity carbon to minimize charging

### ORDERING INFORMATION

| Cat. No | Window(s) (Dim.) | SiN (Th) | Qty |
|---|---|---|---|
| **Silicon Nitride Microporous TEM Window Grids (2.0 µm pores with labeled grid)** | | | |
| **76042-40** | 500µm sq. | 20nm | 10/pk |
| **76042-41** | 500µm sq. | 50nm | 10/pk |
| **Silicon Nitride Nanoporous TEM Window Grid** | | | |
| **76042-42** | 500µm sq. | 20nm | 10/pk |
| **Silicon Nitride TEM Window Grids** | | | |
| **76042-43** | 25µm sq. | 5nm | 10/pk |
| **76042-44** | (8) 50µm sq., (1) 50x100µm | 5nm | 10/pk |
| **76042-45** | (2) 50x1500µm | 5nm | 10/pk |
| **76042-46** | (8) 100 sq., (1) 100x350µm | 10nm | 10/pk |
| **76042-47** | (8) 250 sq., (1) 250x500µm | 10nm | 10/pk |
| **76042-48** | (8) 100 sq., (1) 100x350µm | 20nm | 10/pk |
| **76042-49** | 500µm sq. | 20nm | 10/pk |
| **76042-50** | (9) 100µm sq. | 50nm | 10/pk |
| **76042-51** | 1000µm sq. | 50nm | 10/pk |
| **76042-52** | 500µm sq. | 50nm | 10/pk |
| **76042-53** | 100µm sq. | 50nm | 10/pk |

## Silicon Dioxide TEM Window Grids

*Engineered to be easier to handle.*

By making the grids slightly narrower users now have easy access to grids in TEM holders. No more fumbling with tweezers while trying to pick up or put down grids. The new TEM Window grid shape is still compatible with all standard holders. TEM Window dimensions are 2.9mm in diameter and 100µm thick.

### FEATURES

- **Plasma Cleanable —** Can be vigorously plasma cleaned to remove organic contamination
- **Field to Field Uniformity —** Reduced variability
- **Tolerates temperatures above 1000°C —** Supports use in environmental TEMs where dynamic processes are observed at high temperatures
- **Withstands Harsh Conditions —** Provides an ideal balance of imaging resolution, chemical stability and mechanical strength
- **Incorporates stoichiometric silicon dioxide —** Offers the ability to analyze for nitrogen by EDX techniques

### SPECIFICATIONS

100 micron thick frame, fits 3 mm sample holders

Non-Porous films are lightly wrinkled with approximately 5 microns or less deflection across 100 microns of travel. This is typically not problematic for high-resolution imaging.

GFLAT silicon oxide films are created by a proprietary process that uniquely results in flat, suspended silicon oxide membranes. These membranes are ideally suited for biological imaging studies, with a glass-like hydrophilic surface. These TEM Windows are essentially micro-scale glass cover slips.

### ORDERING INFORMATION

| Cat. No | Window(s)(Dim.) | $SiO_2$ (Th) | Qty |
|---|---|---|---|
| **Non-Porous Silicon Dioxide TEM Windows** | | | |
| **76042-90** | (8) 100µm, (1) 100x350µm | 40nm | 10/pk |
| **76042-91** | (8) 50µm, (1) 50x100µm | 20nm | 10/pk |
| **Non-Porous Silicon Dioxide G-FLAT Window** | | | |
| **76042-92** | 1000µm sq. | | |



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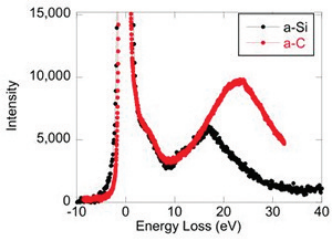
# Pure Silicon TEM Windows

*Pure Silicon sets these TEM windows apart from the rest*

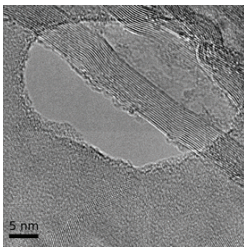
**5nm, 9nm, 15nm, 35nm**

## FEATURES

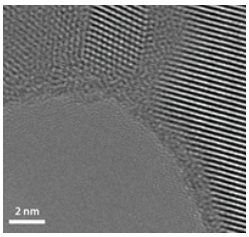
- **Nanometer Thinness —** Pure Silicon TEM Windows feature imaging windows with 5 to 35nm thickness, reducing background contribution and interference for higher contrast imaging. Most impressively, 5nm thick Non-Porous Pure Silicon TEM Windows are thinner than the thinnest commercially available amorphous carbon membranes.
- **Plasma Cleanable —** can be vigorously plasma cleaned to remove organic contamination, unlike traditional carbon grids
- **Field to Field Uniformity —** Non-Porous Pure Silicon TEM Windows are more consistently thin than carbon grids, reducing field-to-field variability. (Note: Porous windows do have inherent crystalline features, but feature background-free nanometer-scale pores).
- **Reduced Chromatic Blur—** In comparison to the thinnest commercially available amorphous carbon membranes, 5 nm Non-Porous Pure Silicon TEM Windows yield half the chromatic blur. This dramatic difference results from a two-fold reduction in inelastic scattering of electrons passing through the thinner membranes of Silicon TEM Windows. In turn, the reduced chromatic blur offers a potential two-fold improvement in imaging resolution.



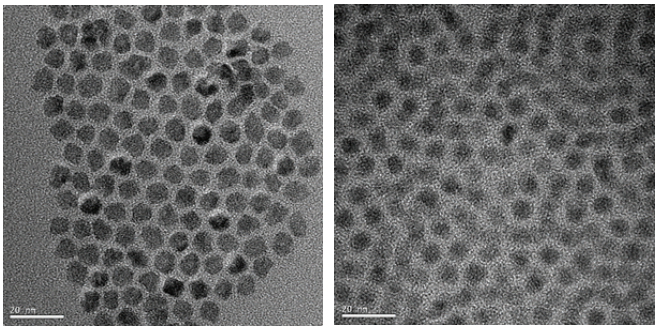

- **Nanometer-Scale Pores —** Pure Silicon TEM Windows are available as porous films with pores ranging from 5 to 50 nm in diameter. The pores allow simple and stable suspension of nanoscale materials for imaging without intervening background.




- **Silicon Composition —** The elemental silicon composition of TEM Windows remarkably increases stability at high beam currents and at high annealing temperatures. The Pure Silicon composition also introduces a minimal background signal, making elemental analyses of sample containing nitrogen and/or carbon possible by EDX and EELS.
- **Isolated Poly-Crystallinity —** The polycrystalline nature of porous Pure Silicon TEM Windows offers an internal calibration standard for x-ray diffraction studies. The isolated crystalline features also provides a convenient and reliable scale for high-resolution size measurements, well-characterized crystal lattice of silicon.




- **Hydrophilicity —** The hydrophilicity of both non-porous and porous Pure Silicon TEM Windows is tunable by plasma and/or ozone treatment making sample preparation easier, particularly for samples in aqueous solutions.
- **Increased Stability —** At high beam currents and high annealing temperatures (600°C for non-porous, >1000°C for nanoporous)
- **Silicon Composition —** Sputter-deposited, pure, intrinsic silicon
- **Minimal Background Signal —** Enables elemental analyses of samples containing nitrogen and/or carbon

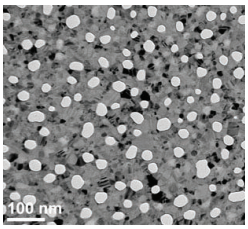


*Lead Selenide nanoparticles on 5 nm non-porous Pure Silicon TEM Window (left) and conventional carbon film (right). Particles provided by Chris Evans, University of Rochester and imaged by Brian McIntyre, University of Rochester.*

## OPTIONS

**Nanoporous —** Using P30 membranes has made the Nanoporous TEM windows significantly more porous. Pore sizes have increased to include a range of pores from 10-60 nanometers in diameter.

**Single Crystal —** with <1-0-0> orientation, offers a very thin 35nm membranes for diffraction studies and other applications requiring uniform background from a single crystal film.




*Nanoporous Low-resolution TEM image of a new P30 Nanoporous TEM Window*

**Non-porous —** Non-Porous films are lightly wrinkled with approximately 5 microns or less deflection across 100 microns of travel. This is typically not problematic for high-resolution imaging.

## ORDERING INFORMATION

| Cat. No | Window(s) (Dim.) | Si (Th) | Qty |
|---|---|---|---|
| **Single Crystal Pure Si TEM Windows** | | | |
| **76042-70** | (8) 100µm, (1) 100x350µm | 35nm | 10/pk |
| **Non-Porous Pure Si TEM Windows** | | | |
| **76042-71** | 25µm sq. | 5nm | 10/pk |
| **76042-72** | (8) 50µm sq., (1) 50x100µm | 5nm | 10/pk |
| **76042-73** | (2) 50x1500µm | 5nm | 10/pk |
| **76042-74** | (8) 100 sq.,(1) 100x350µm | 9nm | 10/pk |
| **76042-75** | (2) 100x1500µm | 9nm | 10/pk |
| **76042-76** | (8) 100 sq., (1) 100x350µm | 15nm | 10/pk |
| **76042-77** | (2) 100x1500µm | 15nm | 10/pk |
| **Nanoporous Pure Si TEM Windows** | | | |
| **76042-78** | 500µm sq. | - | 10/pk |
| **76042-79** | (8) 100 sq., (1) 100x350µm | - | 10/pk |

# TEM SUPPLIES

## Wet "Liquid" TEM Kit

### Why K-Kit?

K-kit Meets All Needs for Liquid TEM

**1 Native State in Liquid**

- **Available with undiluted solution.**
- **Preserve the original morphology and physical state in liquid**

**2 In-situ Observation**

- **Kinetic mechanism of metal growth or physicochemical reaction process in liquid can be in-situ observed with increased reaction time.**

**3 Quantitative Analysis**

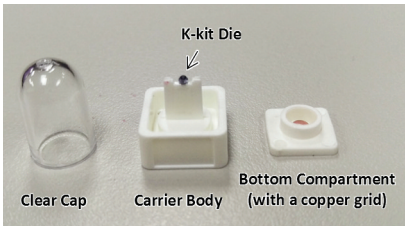
- **Software of image recognition for nanoparticle size distribution analysis.**

**4 Compatible with Versatile Microscopy Analyses**

- **Applicable to TEM, FIB, and STEM.**
- **Available for EDX analysis.**
- **High resistance to most chemicals.**
- **Working temperature range from -40°C to 120°C.**

Patents being issued and publication:

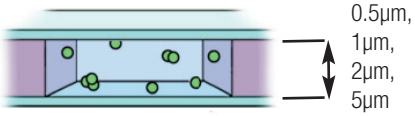
US 7807979 B2
US 8969827 B2
Anal. Chem.2012, 84: 6312-6316




**Dimensions**

**Window Length:** 300µm, Width 25µm

**Channel Height (H):** **0.2 and 2.0 standard**
0.5, 1.0 and 5.0 available



H = 0.2µm, 0.5µm, 1µm, 2µm, 5µm

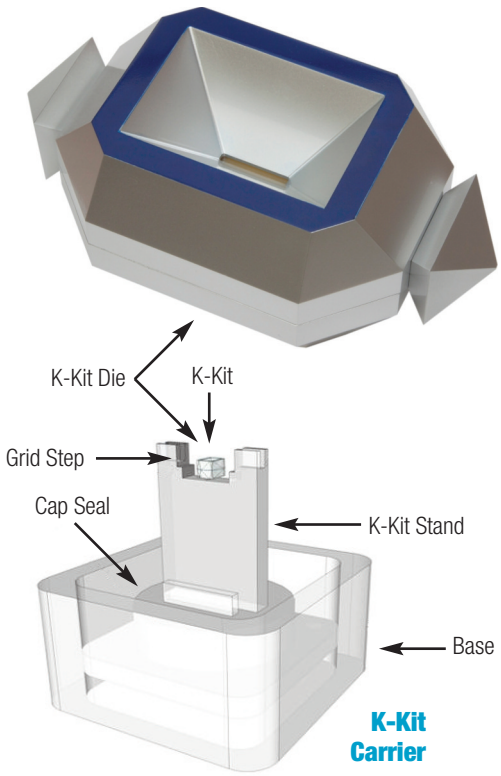
## III K-Kit

A Specimen Holder for Liquid Sample Analysis in TEM

### OVERVIEW

K-kits are sample holders designed to facilitate convenient TEM observation of liquid samples, allowing nano-objects, aggregates, and agglomerates (NOAAs) in liquid samples to be characterized.

With vacuum compatible sealing of liquids in electron-transmitting thickness, K-kits are micro reaction chambers for countless experiments in materials, chemical, and biological research.

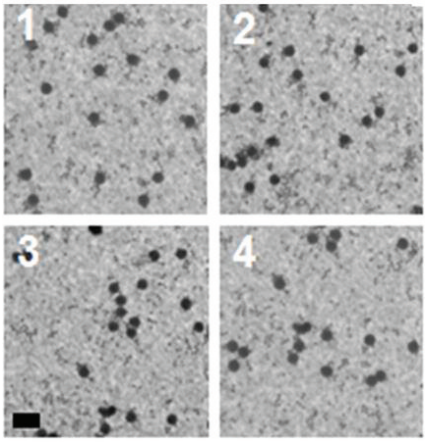



### FEATURES

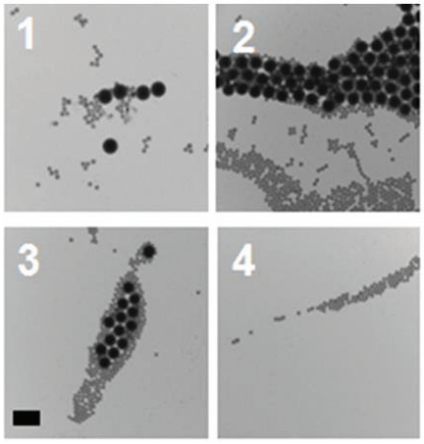
- **Applicable for most TEM holder brands**
- **Strong structural reliability under vacuum**
- **Sealing glue compatible to many solvents**
- **Disposable**
- **Free of cross-contamination**
- **Easy to use**

## Sample Analysis Comparison

**K-kit** **original physical state**




**Conventional** **aggregated after drying**




Images shown: NIST traceable polystyrene beads. Scale Bar 500nm.

| Physicochemical Parameters | K-kit | Cu-Grid |
|---|---|---|
| Composition | ✓ | ✓ |
| Size | ✓ | ✓ |
| Shape | ✓ | ✓ |
| Size Distribution | ✓ | Δ |
| Aggregation and Agglomeration *in liquid* | ✓ | X |
| Particle Concentration | ✓ | X |
| Liquid TEM Observation | ✓ | X |

✓ = Good Δ = Case Dependent X = Not Available



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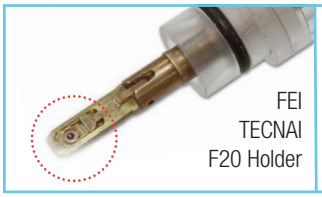
## Wet "Liquid" TEM Kit (continued)

# K-kit Adaptability

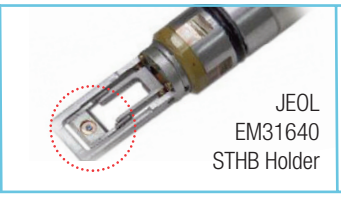
**Compatible with all kinds of TEM Holders**

K-Kit

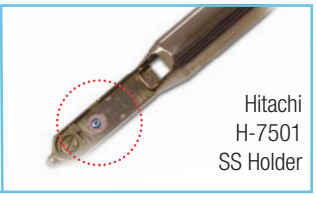
Copper Grid



FEI
TECNAI
F20 Holder



JEOL
EM31640
STHB Holder

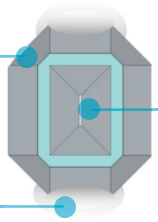


Hitachi
H-7501
SS Holder

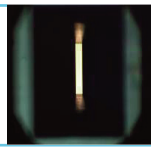
### Strong Structural Reliability under Vacuum

**Silicon Body (MEMS technology):** Use a Si-based structure, ensuring strength and reliability. (MEMS, Micro-Electro-Mechanical Systems)

**Torr Seal® Epoxy:** A trusted and widely-used glue, suitable for high-vacuum systems. (Torr Seal®, a trade mark owned by Agilent Tech. Inc.)



**Silicon Nitride Observation Window:** Material intrinsically tough, durable to withstand drastic pressure changes.



### Sealing glue compatible with many solvents

The following table shows the test results of Torr Seal Epoxy soaked in chemical solvents for 24 hours and then examined using FTIR (if dissolved), and visual observation (if dispersed).

| | Water | PEG400 | DMSO | Ethanol | 0.1N HCl | 0.1N KOH |
|---|---|---|---|---|---|---|
| **Compatibility (FTIR)** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | **Hexane** | **IPA** | **Methanol** | **DCM** | **THF** | **Acetone** |
| **Compatibility (FTIR)** | ✓ | ✓ | ✓ | X | X | X |

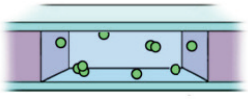
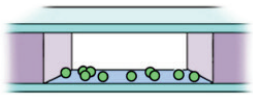
(FTIR, Fourier Transform Infrared Spectroscopy) ✓ = Compatible (FTIR not detected) X = Use with care (FTIR detected)

# Wet and Thin Layer Mode of K-kit

The K-Kit can be used in either Wet Mode or Thin Layer Mode.

**Wet Mode:** The loaded liquid sample is sealed and imaged using TEM in the native liquid environment.

**Thin Layer Mode:** A patented liquid drying protocol preserves the original morphology and physical state of nanomaterials with improved imaging resolution.

| Sample Preparation | Wet Mode | Thin Layer Mode |
|---|---|---|
| **Inner Status of K-kit** | **With Liquid**  | **Dried**  |
| **Imaging Resolution** | Good | Excellent |
| **Gap Size (Considered)** | 300～500nm | 2000～3000nm |
| **Particle Size (Loadable)** | 10nm～300nm | 3nm～2000nm |
| **Particle Shape** | Keeping original | Potentially, could be deformed. |
| **Chemical Reduction or Potential Damage by Electron Energy** | High | Low |

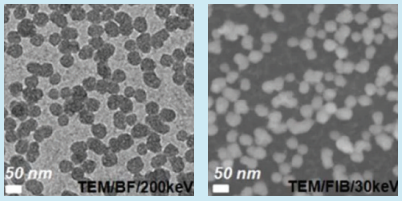
If making a Thin Layer (Dried) mode of K-kit, it's essential to keep both ends of the channel open to atmosphere, no need to do the channel gluing step.

| Gap Height (um) | 0.1 | 0.2 | 0.5 | 1.0 | 2 |
|---|---|---|---|---|---|
| Wet Mode | ● | ● | ◗ | — | — |
| Thin Layer Mode | ◗ | ● | ● | ● | ● |

## EXAMPLES

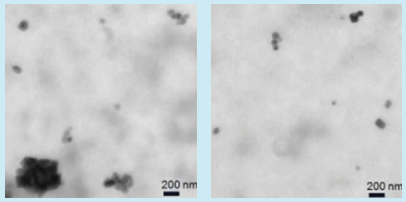
## Characterizing NOAAs in liquid

### Electronics



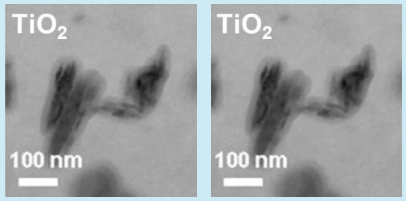

$SiO_2$ Nanoparticles in Polishing Slurry

### Food & Beverage



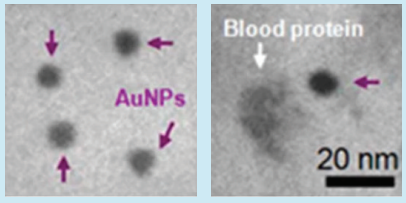

$CaCO_2$ Nanoparticle Additives in Milk

### Cosmetics




$TiO_2$ and ZnO Nanoparticles in Sunscreen Lotion

### Pharmaceuticals




Gold Nanoparticles (AuNPs) in Blood

# TEM SUPPLIES

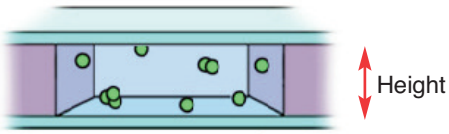
## Wet "Liquid" TEM Kit (continued)

## COMPONENTS

- **Tools are optional available in a Tool Set or ordered individually. The glues are also available.**
- **Figures are for illustration purposes. The tools you order may be different in color and/or from minor design changes.**

### K-kits

Two gap heights (H) available: 0.2µm or 2µm. Two package options: 4 or 6 K-kits per pack. Additional gap heights and pack sizes available upon request.

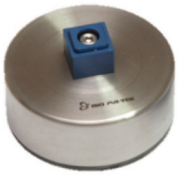



| Cat. No. | Description | Qty. |
|---|---|---|
| **K7260-402** | K-kit, 0.2µm gap height | 4/pk |
| **K7260-420** | K-kit 2.0µm gap height | 4/pk |
| **K7260-602** | K-kit 0.2µm gap height | 6/pk |
| **K7260-620** | K-kit 2.0µm gap height | 6/pk |

### K-kit Tool Box

The K-kit Tool box houses a full tool set, including K-kit holder, Sample Loading Stage, Needle Pen, Gluing Stand, Channel Opener, Sealing Glue, Mounting Glue, Glass Slides, 6/pk of K-kits (2.0µm or 0.2µm gap height), Shipping Box (empty), and some replacement parts.

| Cat. No. | Description | Qty. |
|---|---|---|
| **K7261-R** | K-kit Tool Box, 2.0 µm, Silver, includes full tool set | each |
| **K7261-S** | K-kit Tool Box, 0.2 µm, Silver, includes full tool set | each |



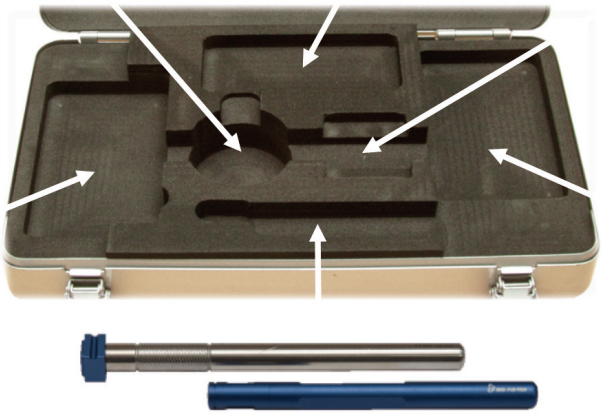
K-kit Gluing Stand


Glass-slide Pack
(Six slides inside for free)

Sample-loading Stage



Accessory Box



K-kit Holder & Needle Pen


K-kit Shipping Package
(Without K-kits)



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## Wet "Liquid" TEM Kit (continued)

# ACCESSORIES


### K-kit Holder

The K-kit Holder consists of an anodized aluminum header and a stainless steel handle. The K-kit carrier fits on the header (after removing the bottom compartment). When the notch on the side of the header fits over the horizontal bar on the Loading Stage (see below), the K-kit on the carrier attached on the header will be just above the liquid sample.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7263 | K-kit Holder | each |

### Needle Pen

The Needle Pen is designed to facilitate the K-kit gluing operation. It has a thin needle 3.0 mm long and 0.27 mm in diameter. The thin needle makes it convenient to pick just enough glue (of the order of 0.1µl[x]) for sealing the channel openings and (around 1µl[x]) for mounting the copper grid. The needle is made of stainless steel. It is strong, yet slightly flexible, suitable for the job.

**Notes:**

It is important to keep the needle free of residue glue. Please wipe the needle clean right after each use. It will be practically impossible to clean the needle once residue glue on it cures.

The needle is held in place in the pen by a set screw on the side of the pen. A replacement needle and a small Allen key are provided with each Needle Pen. The needle is sharp. Please handle with care.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7265 | Needle Pen | each |

### Sample-Loading Stage

The Loading Stage consists of an anodized aluminum body. It has a horizontal bar in a recess on the side and a hole in the middle to house the Liquid Stage, which is a removable stainless steel rod. The removable design is for easy cleaning. The horizontal bar defines the rotational axis for the K-kit Holder, which has a notch on the header to fit on the horizontal bar.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7264 | Sample Loading Stage | each |

### Gluing Stand

The Gluing Stand has a stainless steel base and an anodized aluminum header, which is much like the header on the K-kit holder, without the notch on the side. The Gluing Stand keeps the K-kit carrier in place for gluing work.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7266 | Gluing Stand | each |

### Channel Opener

The Channel Opener is used to remove the channel tips, while the K-kit stays on the carrier. It's made of anodized aluminum with a cut-off slot design at one end.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7269 | Channel Opener | each |

### Copper Grids


Ten pieces of Copper Grid per pack.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7270 | Copper Grid | 10/pk |

### Accessory Box


The Accessory Box contains sealing and mounting glues, four plastic sticks, and spare parts, including a spare needle, an Allen key for the Needle Pen, a Channel Opener, and two Liquid Stages. (The label can be redesigned.)

| Cat. No. | Description | Qty. |
|---|---|---|
| K7267 | Accessory Box | each |

### Starter Box


The Starter Box contains all of the essentials for K-kit loading. It consists of glues, a beaker, four stirring sticks, and two stainless steel thin needles.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7268 | Starter Box | each |

### Glue Box

The Glue Box contains recommended sealing and mounting glues, and four plastic stirring sticks.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7272 | Glue Box | each |

### Slide-Glass Pack

Six glass slides per pack.

| Cat. No. | Description | Qty. |
|---|---|---|
| K7271 | Slide-Glass Pack | 6/pk |

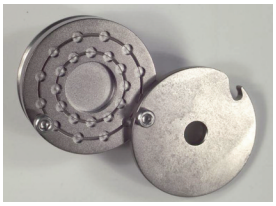
# TEM SUPPLIES

## TEM Grid Holder on a Pin

This EMS new release allows for the holding of up to 4 grids. Made from Aluminum with a brass Screw this holder allows you to image and analyze specimens on TEM Grids in the SEM. The Overall diameter of the holder is 1" (25mm) with a 1/8" Pin (3.2mm) and a longer pin 0.6" (15mm). The Grid locations are all numbered

| | | |
|---|---|---|
| **75949-03** | TEM Grid Holder on Pin | each |

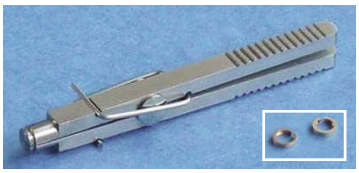
## TEM Grid Freeze Drying Holder



Freeze drying holder to hold 24 standard TEM grids.

| | | |
|---|---|---|
| **EMS063** | TEM Grid Freeze Drying Holder | each |

## 3 mm Circlips and Insertion Tool



Circlips are for all EMS TEM sample holders and specimen rods. They are made from heat treated Beryllium copper.

The Circlip extraction tool is for removing our Circlips from all TEM sample holders.

| | | |
|---|---|---|
| **EMS015** | 3 mm Circlips | each |
| **EMS016** | Circlips Insertion Tool | each |

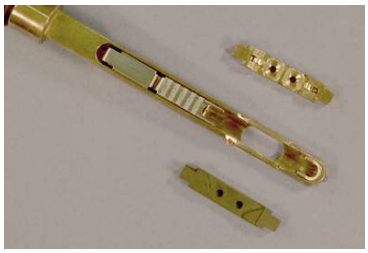
## JEOL 2-Position Single Tilt Holder

A single tilt two-grid sample holder. Grids are held in place by easy to remove circlips.

Comes complete with loading stand, circlip extraction tool, and is supplied in its own mahogany box.

| | | |
|---|---|---|
| **EMS017** | JEOL 2-Position Single Tilt Holder | each |

## JEOL 3-Position Grid Insert

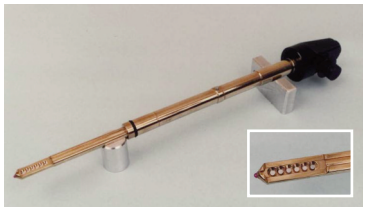


A three position insert which will fit standard JEOL 2 position holders as a direct replacement.

Specimens are held in place with our push fit, easy to use circlips. The circlip extraction tool, Cat. #EMS016 is needed to install and remove circlips.

| | | |
|---|---|---|
| **EMS056** | JEOL 3-Position Grid Insert | each |

## JEOL 2-Position Single Tilt Holder



A single tilt multi-grid holder. Will accommodate 6 grids with an easy click stop reproducible movement between each specimen. It is ideal for scanning through serial sections or for comparing against a standard.

Grids are held in place by easy to remove circlips. Comes complete with loading stand, circlip extraction tool, and is supplied in its own mahogany box.

| | | |
|---|---|---|
| **EMS027** | JEOL 2-Position Single Tilt Holder | each |

## Hitachi 3-Position Multi-Sample Holder

A single tilt multi-grid holder. Will accommodate 3 grids with easy reproducible movement between each specimen. It is ideal for scanning through serial samples or for comparing against standards.

Grids are held in place by easy to remove circlips.

Comes complete with loading stand, circlip extraction tool, and is supplied in a mahogany box.

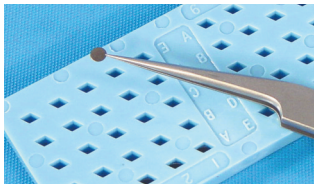
| | | |
|---|---|---|
| **EMS022** | Hitachi 3-Position Multi-Sample Holder | each |

# RELATED PRODUCTS... Sample Preparation, TEM Checker, Membrane Boxes, Gel Boxes

### XTEM TEM Sample Preparation Kit

EMS offers this kit specifically for the preparation of cross-sectional TEM (XTEM) specimens.

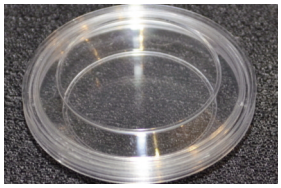
**See pages 134–135.**



### TEM Checker

Monitor the performance of your x-ray detectors. Contains (5) 3mm dia. manganese disks in a standard grid storage box.

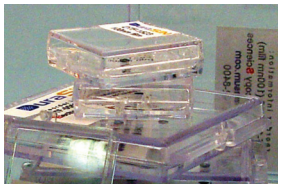
**See page 102.**



### Membrane Boxes

Unique membrane storage boxes for the transfer, storage and shipping of many delicate items. 5 different shapes and sizes.

**See page 12.**



### Gel-Pak® Storage/ Carrier Boxes

Patented gel technology – the innovative solutions for storage and carrying delicate materials.

**See page 13.**



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## Philips Bulk Sample Holder for Compustage

A single-tilt multi-functional sample holder.

For use in either SEM or TEM modes.

Includes slit serial section tip, 10 bulk, and a TEM 3.05 mm grid holder for use with TEM or STEM.

Comes supplied in its own mahogany box, with a loading stand, and a circlip extraction tool.

| | | |
|---|---|---|
| **EMS054** | Philips Bulk Sample Holder for Compustage | each |

## Philips Single Tilt Single-Sample Holder

A single tilt single sample holder. Will accommodate 3 mm grids. Grids are held in place by easy to remove circlips. Comes complete with loading stand, circlip extraction tool, and is supplied in its own box. Suitable for 400 and non-compustage microscopes.

| | | |
|---|---|---|
| **EMS021** | 4-Position Multi-Sample Holder | each |

## Philips 4-Position Multi-Sample Holder

A single tilt multi-grid holder. Will accommodate 4 grids with easy reproducible movement between each specimen. It is ideal for scanning through serial samples or for comparing against standards.

Grids are held in place by easy to remove circlips. Comes complete with loading stand, circlip extraction tool, and is supplied in a mahogany box. Suitable for 400 and non-compustage microscopes.

| | | |
|---|---|---|
| **EMS020** | Philips 4-Position Multi-Sample Holder | each |

## SampleSaver™

### Portable Storage Containers

Our custom storage container for the storing and transporting of samples for SEM, TEM, FIB, AFM, etc. This device is different from a vacuum storage unit or from desiccators. The unit allows you to evacuate and backfill or purge with dry nitrogen. You can then pressurize the container to eliminate the possibility of diffusion into the container. It is ideal for shipping or storing sensitive samples from lab to lab.

| Cat. # | Description | Qty |
|---|---|---|
| **76540-01** | Small Portable Storage Container, SS100 | each |
| **76540-02** | Large Portable Storage Container, SS200 | each |

### Sample Racks for the SS100 Sample Saver™

These sample racks are designed to fit into the SS100 Sample Saver™ for the storage of TEM grid boxes or aluminum stubs that needed to store in safe environment.

| Cat. # | Description | Qty |
|---|---|---|
| **76541-10** | Model SS100-TEM – TEM Grid Box Holder. Consists of 3 vented TEM grid boxes and storage rack to fit into SampleSaver™ SS100 | set |
| **76541-20** | Model SS100-125 – ⅛" SEM Stub Holder. Consists of 3 tiers sample rack. Each shelf holds 5 SEM stubs with ⅛" pin. (SEM stubs not included) | set |
| **76541-30** | Model SS100-375 – ⅜" SEM Stub Holder. Consists of 3 tiers sample rack. Each self holds 3 SEM stubs with ⅜" pin (SEM Stub not included) | set |
| **76541-40** | Model SS100-125-1 – ⅛" SEM Stub Holder. Consists of 3 tiers sample rack. Bottom shelf holds 1" dia sample mount and top two shelves each hold 5 SEM stubs with ⅛" pin (SEM stubs not included) | set |
| **76541-50** | Model SS100-375-1 – ⅜" SEM Stub Holder. Consists of 3 tiers sample rack. Bottom shelf holds 1" dia sample mount and two top shelves each hold 3 SEM stubs ⅜" pin (SEM stubs not included) | set |

### Sample Racks for the SS200 Sample Saver™

These sample racks are designed to fit into the SS200 Sample Saver™ for the storage of TEM grid boxes or aluminum stubs that needed to store in safe environment.

| Cat. # | Description | Qty |
|---|---|---|
| **76542-00** | Model SS200-FIB – FIB Sample Holder to store SBT CastleGuard™ Holders (CastkeGuard™ holders not included) | set |
| **76542-20** | Model SS200-125 – ⅛" SEM Stub Holder. Consists of 5 tiers sample rack. Each shelf holds 5 SEM stubs with ⅛" pin. (SEM stubs not included) | set |
| **76542-30** | Model SS200-375 – ⅜" SEM Stub Holder. Consists of 5 tiers sample rack. Each self holds 3 SEM stubs with ⅜" pin (SEM Stub not included) | set |
| **76542-40** | Model SS200-125-1 – ⅛" SEM Stub Holder. Consists of 5 tiers sample rack. Bottom shelf holds 1" dia sample mount and top four shelves each hold 5 SEM stubs with ⅛" pin (SEM stubs not included) | set |
| **76542-50** | Model SS200-375-1 – ⅜" SEM Stub Holder. Consists of 5 tiers sample rack. Bottom shelf holds 1" dia sample mount and four top shelves each hold 3 SEM stubs ⅜" pin (SEM stubs not included) | set |

## TEM SUPPLIES

# Graphene Support Films for TEM

# EXCLUSIVE

## OVERVIEW

*Graphene is a single atomic layer of carbon atoms tightly packed in a two-dimensional honeycomb lattice. This novel material is atomically thin, chemically inert, consists of light atoms, and possesses a highly ordered structure. Graphene is electrically and thermally conductive, and is the strongest material ever measured. These remarkable properties make graphene the ideal support film for electron microscopy.*

## POTENTIAL APPLICATIONS:

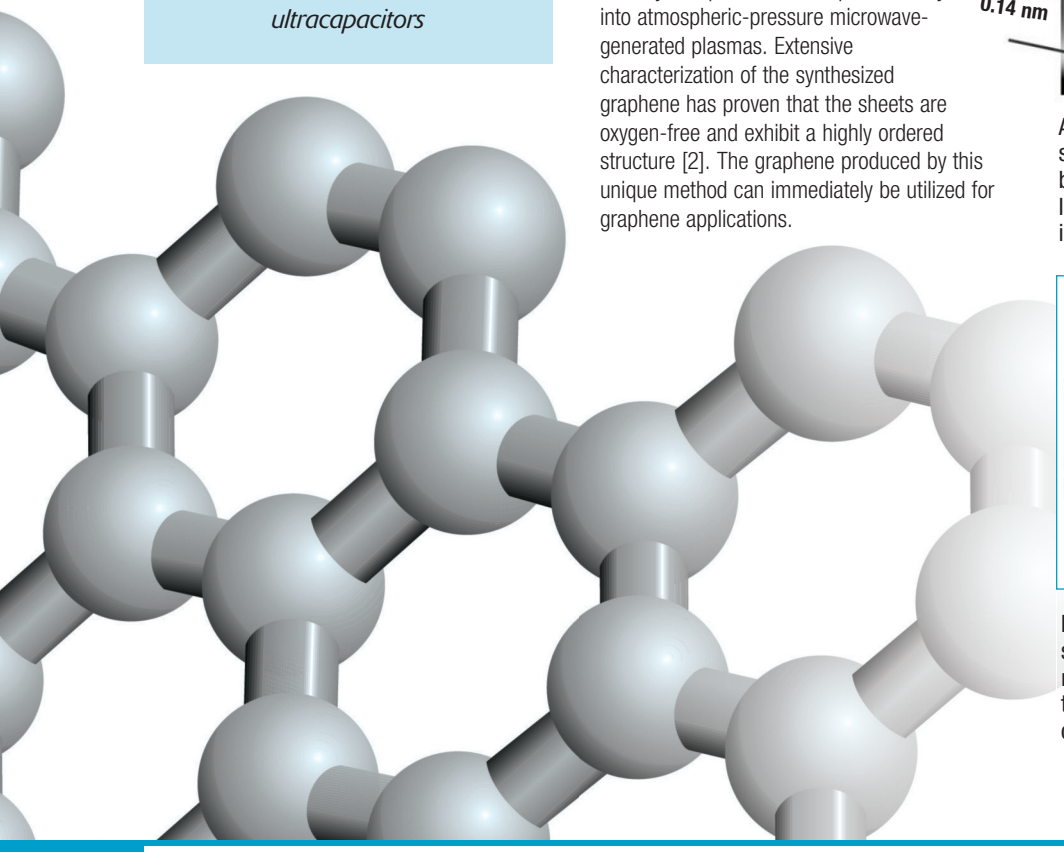
*biodevices*

*single molecule gas detection*

*graphene nanoribbons*
*integrated circuits*

*transparent conducting electrodes*

*ultracapacitors*

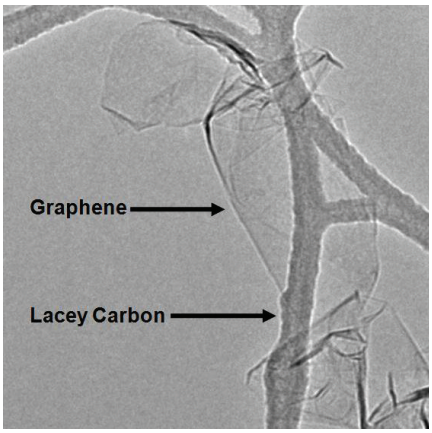


## SYNTHESIS

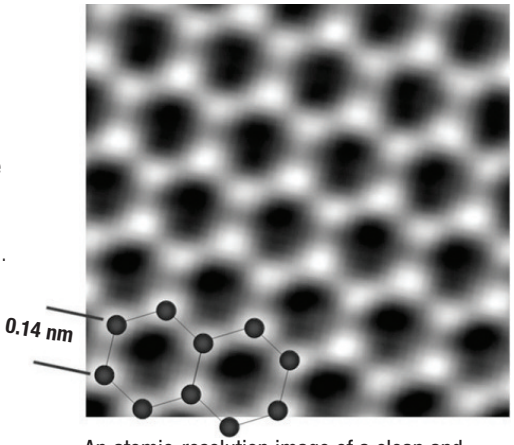
*the substrate-free gas-phase method*

Graphene is a single atomic layer of carbon atoms tightly packed in a two-dimensional honeycomb lattice. The novel material has generated great interest throughout the scientific and technological community because of its remarkable properties and numerous potential applications. However, obtaining pure and highly ordered graphene has been a challenge. Small quantities of ultrahigh-quality graphene have been isolated through an unwieldy and time-consuming process involving the mechanical exfoliation of highly oriented pyrolytic graphite. Alternative methods require substrates or graphite to create atomically-thin sheets, and these techniques involve multiple steps, expensive substrates, or non-ambient conditions. Furthermore, the sheets produced by these alternative methods exhibit defects, disorder, and oxygen functionalities that have a detrimental effect on the properties of graphene.

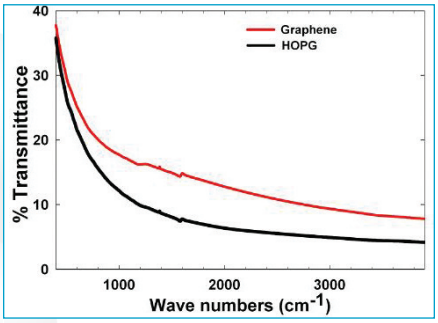
The substrate-free gas-phase method is the first and only process that can synthesize ultrahigh-quality graphene in a single step, without the use of substrates or graphite [1]. Graphene sheets are created through the delivery of liquid alcohol droplets directly into atmospheric-pressure microwave-generated plasmas. Extensive characterization of the synthesized graphene has proven that the sheets are oxygen-free and exhibit a highly ordered structure [2]. The graphene produced by this unique method can immediately be utilized for graphene applications.




A typical TEM image of graphene sheets freely suspended on a lacey carbon TEM grid.




An atomic-resolution image of a clean and structurally perfect graphene sheet synthesized by the substrate-free gas-phase method. Individual carbon atoms appear white in the image.




Elemental analysis by FT-IR reveals that the synthesized graphene sheets are free of detrimental oxygen functionalities. The FT-IR spectrum of synthesized graphene is similar to that of highly oriented pyrolytic graphite (HOPG).



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## Graphene Support Films for TEM (continued)

### APPLICATION

*Direct imaging of soft and hard nanomaterials*

The interfaces between soft and hard nanomaterials have been the subject of extensive research.

Nanoparticles coated with molecular layers have been shown to self-assemble into novel structures that could potentially be used in electronics, sensors, and photonics. Self-assembly is influenced by the nature of molecular coatings and thus more detailed characterization of these soft materials is needed.

However, imaging surface molecules and their interfaces with nanoparticles at the atomic scale is a significant challenge. The transmission electron microscope (TEM) imaging of functionalized nanoparticles has been attempted.

However, it has not been possible to observe molecular surface layers and their interfaces with nanoparticles at the atomic level. Modern aberration-corrected TEMs can produce atomic-resolution images of soft and hard nanomaterials. However, conventional TEM support films (e.g. ultrathin amorphous carbon) limit the capabilities of these advanced microscopes because they contribute to overall electron scattering and diminish the contrast of low-atomic number specimens. The TEM imaging of the interfaces between soft and hard nanomaterials therefore requires better support films that have a lower dynamical interference with an imaging object [3].

Graphene is the ideal TEM support film. The material possesses a highly ordered structure and is atomically thin, chemically inert, structurally stable, and electrically and thermally conductive. The ultrahigh-quality graphene produced by the substrate-free gas-phase method [1, 2] has enabled the unsurpassed TEM imaging of organic molecules and the interfaces between soft and hard nanomaterials. The pure and highly-ordered sheets were used as a near-invisible support film to directly image the atoms in a gold nanoparticle and its surrounding citrate coating [3]. The results showed that the synthesized graphene can be used to directly observe nanoparticles functionalized with a diverse range of molecular coatings, such as proteins and DNA

We offer ultrahigh-quality graphene that is produced through the substrate-free gas-phase method[1]. The graphene created by this technique possesses a highly ordered structure that is composed of 99% carbon by mass (1% hydrogen)[2]. This graphene was used to directly image gold nanoparticles and their organic surface molecules in both conventional and atomic-resolution TEMs at a level that greatly surpasses any current TEM support film[3].

Our graphene provides an invisible, crystalline background that enables the unrivaled TEM characterization of organic and inorganic nanomaterials.

**References:**

[1] Dato et al., “Substrate-Free Gas-Phase Synthesis of Graphene Sheets”, Nano Letters 8, 2012–2016 (2008).

[2] Dato et al., “Clean and highly ordered graphene synthesized in the gas phase”, Chemical Communications, 6095–6097, (2009).

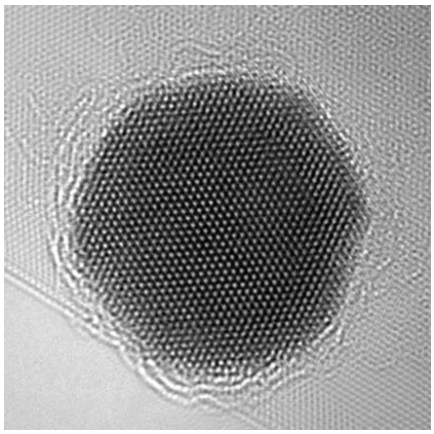
[3] Lee et al., “Direct Imaging of Soft-Hard Interfaces

**Additional References:**

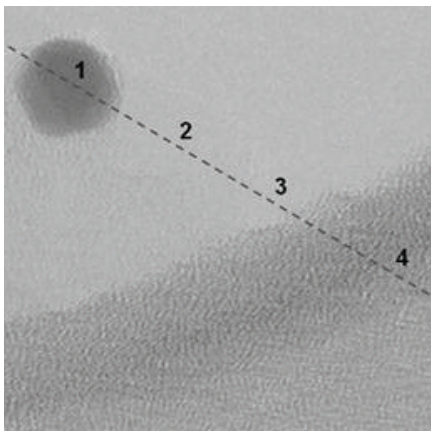
Galatzer-Levy, J. Graphene "sandwich" improves imaging of biomolecules. University of Illinois at Chicago News Center Web Site. February 4, 2014. Available at: http://news.uic.edu/graphene-sandwich-improves-imaging-of-biomolecules. Accessed February 12, 2014.

Wang, C., Qiao, Q., Shokuhfar, T. and Klie, R. F. (2014), High-Resolution Electron Microscopy and Spectroscopy of Ferritin in Biocompatible Graphene Liquid Cells and Graphene Sandwiches. Adv. Mater.. doi: 10.1002/adma.201306069

Dato, A. and Frenklach, M., "Substrate-free microwave synthesis of graphene: experimental conditions and hydrocarbon precursors", New Journal of Physics, 12, 1367-2630 (2010).



An atomic-resolution image of a 10 nm gold nanoparticle and its surrounding citrate capping agent on a synthesized graphene support film.




A low-magnification image of a (1) gold nanoparticle 10 nm in diameter on a (2) transparent synthesized graphene support film, (3) the vacuum, and (4) a lacey carbon support.

### ORDERING INFORMATION

Graphene products come available in five different ways, allowing you to choose which is best for you

**a)** As a solution of 0.1 mg Graphene in 1 ml of Ethanol. A homogeneous solution will take less than 30 seconds to create by sonicating the Graphene-solvent mixture. One is able to coat their own grids using this solution.

**b)** As Graphene-enhanced lacey carbon TEM grids. 200 and 300 mesh. These grids are created by coating our existing lacey carbon grids with graphene. Through a unique drop method, solution is dispersed onto the Lacey Carbon Grid.

**c)** As dry, synthesized Graphene powder, 1 mg.

| Cat. No. | Description | Qty. |
|---|---|---|
| **GF1200** | 0.1 mg Graphene in 1 ml of Ethanol | each |
| **GF1201** | Graphene-Enhanced Lacey Carbon TEM Grid 200 # Cu | each |
| **GF1202** | Graphene-Enhanced Lacey Carbon TEM Grid 200 # Ni | each |
| **GF1203** | Graphene-Enhanced Lacey Carbon TEM Grid 300 # Cu | each |
| **GF1204** | Graphene-Enhanced Lacey Carbon TEM Grid 300 # Ni | each |
| **GF1205** | Synthesized Graphene Powder, 1 mg | each |

# TEM SUPPLIES

## Graphene Support Films for TEM (continued)

## Graphene and Graphene Oxide Films

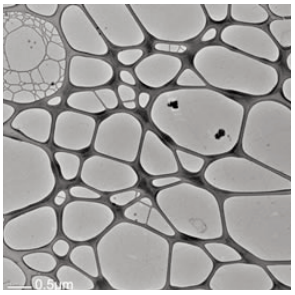
### Graphene on Lacey Carbon 300 Mesh Copper TEM Grids

Graphene TEM support films are supported by a lacey carbon film on a 300 mesh copper TEM grid.

CAS No. 7782-42-5

**Characteristics**

1. Four thicknesses of CVD graphene
   *Available in either 1, 2, 3-5 or 6-8 layers*
2. TEM Substrate
   *Lacey carbon support film on 300 mesh copper TEM grid*
3. Graphene coverage of the TEM grid is better than 75%



Low magnification TEM image of single-layer graphene on lacey carbon film. Typical grain size is in the region of 2-3 µm

**Appearance**

The graphene film appears as a near-transparent to light-grey film on the surface of the Lacey Carbon mesh on a red-brown colored copper TEM grid.

### SPECIFICATIONS

| Type | Thickness of the Graphene | Transparency | TEM Grid/ AFM Substrate | Support Film |
|---|---|---|---|---|
| 1 Layer | ~0.35 nm | ~96.4% | 300 Mesh Copper Grid | N/A |
| 2 Layers | ~0.7 nm | ~92.7% | 300 Mesh Copper Grid | N/A |
| 3-5 Layers | 1.0-1.7 nm | ~85.8-90.4% | 300 Mesh Copper Grid | N/A |
| 6-8 Layers | 2.1-2.8 nm | ~78.5-83.2% | 300 Mesh Copper Grid | N/A |

### ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| **1GLC300Cu-5** | Graphene on Lacey Carbon, 300 Cu | 5/pk |
| **1GLC300Cu-10** | Graphene on Lacey Carbon, 300 Cu | 10/pk |
| **1GLC300Cu-25** | Graphene on Lacey Carbon, 300 Cu | 25/pk |
| **2 Layers** | | |
| **2GLC300Cu-5** | Graphene on Lacey Carbon, 300 Cu | 5/pk |
| **2GLC300Cu-10** | Graphene on Lacey Carbon, 300 Cu | 10/pk |
| **2GLC300Cu-25** | Graphene on Lacey Carbon, 300 Cu | 25/pk |
| **3-5 Layers** | | |
| **3GLC300Cu-5** | Graphene on Lacey Carbon, 300 Cu | 5/pk |
| **3GLC300Cu-10** | Graphene on Lacey Carbon, 300 Cu | 10/pk |
| **3GLC300Cu-25** | Graphene on Lacey Carbon, 300 Cu | 25/pk |
| **6-8 Layers** | | |
| **6GLC300Cu-5** | Graphene on Lacey Carbon, 300 Cu | 5/pk |
| **6GLC300Cu-10** | Graphene on Lacey Carbon, 300 Cu | 10/pk |
| **6GLC300Cu-25** | Graphene on Lacey Carbon, 300 Cu | 25/pk |

### Graphene on Ultra-Fine 2000 Mesh Copper TEM Grids

CAS No. 7782-42-5

**Characteristics**

1. Four thicknesses of CVD graphene
   *Available in either 1, 2, 3-5 or 6-8 layers*
2. TEM Substrate
   *Microporous Copper TEM Grids with Beryllium-Copper Support Aperture*
3. Graphene coverage of the TEM grid is better than 75%

**Appearance**

The graphene film appears as a near-transparent to light-grey film on the surface of the red-brown microporous copper TEM grid. For support, the TEM grid is attached using epoxy to a gold-colored beryllium-copper disk with a 2 x 1 mm aperture.

### SPECIFICATIONS

| Type | Thickness of the Graphene | Transparency | TEM Grid/ AFM Substrate | Support Film |
|---|---|---|---|---|
| 1 Layer | ~0.35 nm | ~96.4% | 2000 Mesh Copper Grid | N/A |
| 2 Layers | ~0.7 nm | ~92.7% | 2000 Mesh Copper Grid | N/A |
| 3-5 Layers | 1.0-1.7 nm | ~85.8-90.4% | 2000 Mesh Copper Grid | N/A |
| 6-8 Layers | 2.1-2.8 nm | ~78.5-83.2% | 2000 Mesh Copper Grid | N/A |

### ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| **1GLC2000Cu-5** | Graphene on Ultra-Fine, 2000 Cu | 5/pk |
| **1GLC2000Cu-10** | Graphene on Ultra-Fine, 2000 Cu | 10/pk |
| **1GLC2000Cu-25** | Graphene on Ultra-Fine, 2000 Cu | 25/pk |
| **2 Layers** | | |
| **2GLC2000Cu-5** | Graphene on Ultra-Fine, 2000 Cu | 5/pk |
| **2GLC2000Cu-10** | Graphene on Ultra-Fine, 2000 Cu | 10/pk |
| **2GLC2000Cu-25** | Graphene on Ultra-Fine, 2000 Cu | 25/pk |
| **3-5 Layers** | | |
| **3GLC2000Cu-5** | Graphene on Ultra-Fine, 2000 Cu | 5/pk |
| **3GLC2000Cu-10** | Graphene on Ultra-Fine, 2000 Cu | 10/pk |
| **3GLC2000Cu-25** | Graphene on Ultra-Fine, 2000 Cu | 25/pk |
| **6-8 Layers** | | |
| **6GLC2000Cu-5** | Graphene on Ultra-Fine, 2000 Cu | 5/pk |
| **6GLC2000Cu-10** | Graphene on Ultra-Fine, 2000 Cu | 10/pk |
| **6GLC2000Cu-25** | Graphene on Ultra-Fine, 2000 Cu | 25/pk |



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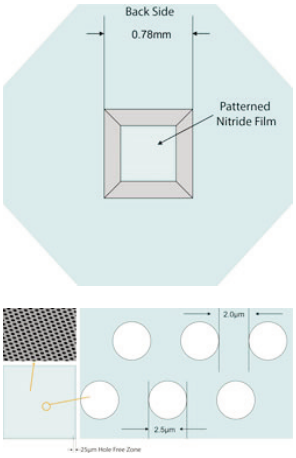
## Graphene Support Films for TEM (continued)

### Graphene and Graphene Oxide Films (continued)

### Graphene on Silicon Nitride TEM Grids (2.5 µm holes)




**Characteristics**

1. Four thicknesses of CVD graphene
   *Available in either 1, 2, 3-5 or 6-8 layers*
2. TEM Substrate
   *200 µm thick 3.0mm hexagonal silicon substrate with a 0.5 x 0.5 mm aperture and 200 nm thick silicon nitride membrane with approximately 6,400 2.5 µm holes*
3. Graphene coverage of the TEM grid is better than 75%

**Appearance**

Solid hexagonal disk with a greenish hue. The graphene film appears as a near-transparent to light-grey film on the surface of the microporous Silicon Nitride membrane.

### Graphene on Ultra-Flat Thermal SiO2 Substrate

**Characteristics**

1. Four thicknesses of CVD graphene
   *Available in either 1, 2, 3-5 or 6-8 layers*
2. TEM Substrate
   *The Ultra-flat Thermal SiO2 Substrate consists of a 200 nm thermally grown SiO2 film on an ultra-flat silicon wafer with a normal thickness of 675 µm. The size is 5 mm x 5 mm.*
3. Graphene coverage of the TEM grid is better than 75%

**Appearance**

The graphene film appears as a near-transparent to light-grey film on the surface of the red-brown microporous copper TEM grid. For support, the TEM grid is attached using epoxy to a gold-colored beryllium-copper disk with a 2 x 1 mm aperture.

## SPECIFICATIONS

| Type | Thickness of the Graphene | Transparency | TEM Grid/ AFM Substrate | Support Film |
|---|---|---|---|---|
| 1 Layer | ~0.35 nm | ~96.4% | 2.5 µm Hole Silicon Nitride | Silicon Nitride |
| 2 Layers | ~0.7 nm | ~92.7% | 2.5 µm Hole Silicon Nitride | Silicon Nitride |
| 3-5 Layers | 1.0-1.7 nm | ~85.8-90.4% | 2.5 µm Hole Silicon Nitride | Silicon Nitride |
| 6-8 Layers | 2.1-2.8 nm | ~78.5-83.2% | 2.5 µm Hole Silicon Nitride | Silicon Nitride |

## ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| **1GSiN2.5um-5** | Graphene on Silicon Nitride, 2.5 µm | 5/pk |
| **1GSiN2.5um-10** | Graphene on Silicon Nitride, 2.5 µm | 10/pk |
| **1GSiN2.5um-25** | Graphene on Silicon Nitride, 2.5 µm | 25/pk |
| **2 Layers** | | |
| **2GSiN2.5um-5** | Graphene on Silicon Nitride, 2.5 µm | 5/pk |
| **2GSiN2.5um-10** | Graphene on Silicon Nitride, 2.5 µm | 10/pk |
| **2GSiN2.5um-25** | Graphene on Silicon Nitride, 2.5 µm | 25/pk |
| **3-5 Layers** | | |
| **3GSiN2.5um-5** | Graphene on Silicon Nitride, 2.5 µm | 5/pk |
| **3GSiN2.5um-10** | Graphene on Silicon Nitride, 2.5 µm | 10/pk |
| **3GSiN2.5um-25** | Graphene on Silicon Nitride, 2.5 µm | 25/pk |
| **6-8 Layers** | | |
| **6GSiN2.5um-5** | Graphene on Silicon Nitride, 2.5 µm | 5/pk |
| **6GSiN2.5um-10** | Graphene on Silicon Nitride, 2.5 µm | 10/pk |
| **6GSiN2.5um-25** | Graphene on Silicon Nitride, 2.5 µm | 25/pk |

## SPECIFICATIONS

| Type | Thickness of the Graphene | Transparency | TEM Grid/ AFM Substrate | Support Film |
|---|---|---|---|---|
| 1 Layer | ~0.35 nm | ~96.4% | N/A | Ultra-Flat Silicon |
| 2 Layers | ~0.7 nm | ~92.7% | N/A | Ultra-Flat Silicon |
| 3-5 Layers | 1.0-1.7 nm | ~85.8-90.4% | N/A | Ultra-Flat Silicon |
| 6-8 Layers | 2.1-2.8 nm | ~78.5-83.2% | N/A | Ultra-Flat Silicon |

## ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| **1GUFSiO2-5** | Graphene on Ultra-Flat Thermal $SiO_2$ | 5/pk |
| **1GUFSiO2-10** | Graphene on Ultra-Flat Thermal $SiO_2$ | 10/pk |
| **1GUFSiO2-25** | Graphene on Ultra-Flat Thermal $SiO_2$ | 25/pk |
| **2 Layers** | | |
| **2GUFSiO2-5** | Graphene on Ultra-Flat Thermal $SiO_2$ | 5/pk |
| **2GUFSiO2-10** | Graphene on Ultra-Flat Thermal $SiO_2$ | 10/pk |
| **2GUFSiO2-25** | Graphene on Ultra-Flat Thermal $SiO_2$ | 25/pk |
| **3-5 Layers** | | |
| **3GUFSiO2-5** | Graphene on Ultra-Flat Thermal $SiO_2$ | 5/pk |
| **3GUFSiO2-10** | Graphene on Ultra-Flat Thermal $SiO_2$ | 10/pk |
| **3GUFSiO2-25** | Graphene on Ultra-Flat Thermal $SiO_2$ | 25/pk |
| **6-8 Layers** | | |
| **6GUFSiO2-5** | Graphene on Ultra-Flat Thermal $SiO_2$ | 5/pk |
| **6GUFSiO2-10** | Graphene on Ultra-Flat Thermal $SiO_2$ | 10/pk |
| **6GUFSiO2-25** | Graphene on Ultra-Flat Thermal $SiO_2$ | 25/pk |

# TEM SUPPLIES

## Graphene Support Films for TEM (continued)

### Graphene and Graphene Oxide Films (continued)

#### Graphene Oxide on Lacey Carbon 300 Mesh Copper TEM Grids

ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| 1GOLC300Cu-5 | Graphene Oxide on Lacey Carbon, 300 Cu | 5/pk |
| 1GOLC300Cu-10 | Graphene Oxide on Lacey Carbon, 300 Cu | 10/pk |
| 1GOLC300Cu-25 | Graphene Oxide on Lacey Carbon, 300 Cu | 25/pk |
| **2 Layers** | | |
| 2GOLC300Cu-5 | Graphene Oxide on Lacey Carbon, 300 Cu | 5/pk |
| 2GOLC300Cu-10 | Graphene Oxide on Lacey Carbon, 300 Cu | 10/pk |
| 2GOLC300Cu-25 | Graphene Oxide on Lacey Carbon, 300 Cu | 25/pk |

#### Graphene Oxide on Silicon Nitride, 2.5 µm

ORDERING INFORMATION

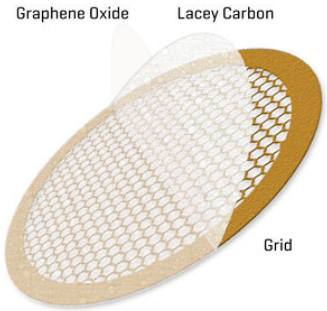
| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| 1GOSiN2.5um-5 | Graphene Oxide on Silicon Nitride, 2.5 µm | 5/pk |
| 1GOSiN2.5um-10 | Graphene Oxide on Silicon Nitride, 2.5 µm | 10/pk |
| 1GOSiN2.5um-25 | Graphene Oxide on Silicon Nitride, 2.5 µm | 25/pk |
| **2 Layers** | | |
| 2GOSiN2.5um-5 | Graphene Oxide on Silicon Nitride, 2.5 µm | 5/pk |
| 2GOSiN2.5um-10 | Graphene Oxide on Silicon Nitride, 2.5 µm | 10/pk |
| 2GOSiN2.5um-25 | Graphene Oxide on Silicon Nitride, 2.5 µm | 25/pk |

#### Graphene Oxide on Ultra-Flat Thermal $SiO_2$

ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **1 Layer** | | |
| 1GOUFSiO2-5 | Graphene Oxide on Ultra-Flat Thermal $SiO_2$ | 5/pk |
| 1GOUFSiO2-10 | Graphene Oxide on Ultra-Flat Thermal $SiO_2$ | 10/pk |
| 1GOUFSiO2-25 | Graphene Oxide on Ultra-Flat Thermal $SiO_2$ | 25/pk |
| **2 Layers** | | |
| 2GOUFSiO2-5 | Graphene Oxide on Ultra-Flat Thermal $SiO_2$ | 5/pk |
| 2GOUFSiO2-10 | Graphene Oxide on Ultra-Flat Thermal $SiO_2$ | 10/pk |
| 2GOUFSiO2-25 | Graphene Oxide on Ultra-Flat Thermal $SiO_2$ | 25/pk |

## Graphene Oxide TEM Support Films




Graphene Oxide (GO) support film is a super thin (<1nm), naturally hydrophilic layer placed over the Holey, Lacey or Quantifoil support film on copper or gold grids. Pre-treatment of GO Support Films is unnecessary - by default, the hydrophilic surface spreads particles evenly across the grid. A hydrophobic surface can be achieved by heating in the air. Note: plasma cleaning or glow discharge will damage the support film.

### FEATURES

- **Works well with Holey Carbon, Lacey Carbon and Quantifoil grid types, effectively spanning the gaps**
- **Less expensive to produce due to complexity of graphene manufacturing**
- **Better background contrast than graphene, results in higher resolution**
- **Nearly transparent in electron beam**
- **Barely visible under optical microscopes**
- **Regular batch checking ensures correct coverage of monolayers**

### ORDERING INFORMATION

#### Graphene Oxide on Holey Carbon Copper Mesh Grids

| Cat. No. | Film | Grid | Mesh | Qty |
|---|---|---|---|---|
| GOHC300Cu10 | GO on Holey Carbon | Cu | 300 | 10/pk |
| GOHC300Cu25 | GO on Holey Carbon | Cu | 300 | 25/pk |
| GOHC300Cu50 | GO on Holey Carbon | Cu | 300 | 50/pk |

#### Graphene Oxide on Lacey Carbon Copper Mesh Grids

| Cat. No. | Film | Grid | Mesh | Qty |
|---|---|---|---|---|
| GOLC300Cu10 | GO on Lacey Carbon | Cu | 300 | 10/pk |
| GOLC300Cu25 | GO on Lacey Carbon | Cu | 300 | 25/pk |
| GOLC300Cu50 | GO on Lacey Carbon | Cu | 300 | 50/pk |
| GOLC300Cu100 | GO on Lacey Carbon | Cu | 300 | 100/pk |

#### Graphene Oxide on Quantifoil Grids

Copper and Gold versions available

| Cat. No. | Film | Grid | Mesh | Qty |
|---|---|---|---|---|
| GOQ200R24Cu10 | GO on Quantifoils R2/4 | Cu | 200 | 10/pk |
| GOQ200R24Cu25 | GO on Quantifoils R2/4 | Cu | 200 | 25/pk |
| GOQ200R24Cu50 | GO on Quantifoils R2/4 | Cu | 200 | 50/pk |
| GOQ300R22Cu10 | GO on Quantifoils R2/2 | Cu | 300 | 10/pk |
| GOQ300R22Cu25 | GO on Quantifoils R2/2 | Cu | 300 | 25/pk |
| GOQ300R24Cu10 | GO on Quantifoils R2/4 | Cu | 300 | 10/pk |
| GOQ300R24Cu25 | GO on Quantifoils R2/4 | Cu | 300 | 25/pk |
| GOQ300R24Cu50 | GO on Quantifoils R2/4 | Cu | 300 | 50/pk |
| GOQ400R1213Au10 | GO on Quantifoils R1.2/1.3 | Au | 400 | 10/pk |
| GOQ400R1213Au25 | GO on Quantifoils R1.2/1.3 | Au | 400 | 25/pk |
| GOQ400R1213Au50 | GO on Quantifoils R1.2/1.3 | Au | 400 | 50/pk |
| GOQ400R1213Cu10 | GO on Quantifoils R1.2/1.3 | Cu | 400 | 10/pk |
| GOQ400R1213Cu25 | GO on Quantifoils R1.2/1.3 | Cu | 400 | 25/pk |
| GOQ400R1213Cu50 | GO on Quantifoils R1.2/1.3 | Cu | 400 | 50/pk |
| GOQ400R1213Cu100 | GO on Quantifoils R1.2/1.3 | Cu | 400 | 100/pk |



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# CALIBRATION STANDARDS & SPECIMENS

**MAGNIFICATION REFERENCE STANDARDS,** SPM CALIBRATION SPECIMENS, **VERY HIGH RESOLUTION CALIBRATION REFERENCE AND TRACEABLE STANDARD FOR AFM, SEM, AUGER, AND FIB,** CALIBRATION TOOLS FOR AFM OR SPM, **MAGICAL™,** X-CHECKER™, **TEM CHECKER™**

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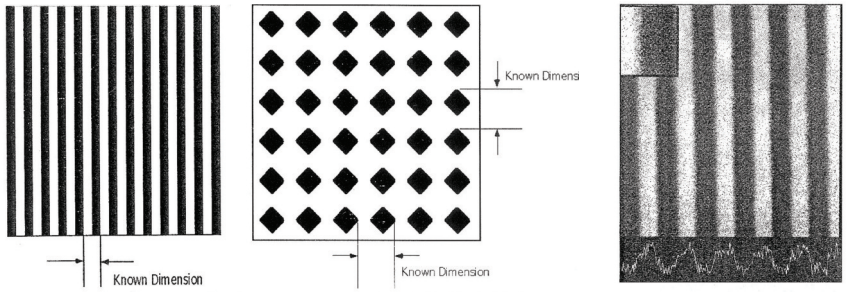
# CALIBRATION STANDARDS & SPECIMENS

## III Magnification Reference Standards – SPM, AFM, SEM Calibration Standards

EMS offers a series of calibration standards with one and two dimension calibrated patterns. The standards come in two grid spacings – 300 nanometers and 700 nanometers. These standards are created utilizing holographic interference of a particular laser frequency. They are typically accurate to <1% across the entire surface of the standard.




### Background

EMS MXS "CE" and "BE" Series SEM magnification reference grating and grids set new standards for sub-micron accuracy and ease-of-use. Designed to meet the requirement for a reasonable cost, accurate sub-micron reference standard, "CE" Series Reference Standards can be tailored to meet a variety of needs. They are ideal for student practice and instruction, testing new ideas or applications, or other uses where you need a good quality standard but don't want to put an expensive sample at risk. ***Exceptional accuracy, repeatability, and uniformity are assured since each individual standard is an original or master produced directly from a holographic interference pattern.*** These reference standards are remarkably dur-able under typical operating conditions. The surface contamination behavior is also very good. There are no better submicron reference standards available in this price range.

***"One test site indicated that on a scale of 1 to 5 with respect to ease of use, contrast/ brightness, durability, and accuracy, "CE" Series Reference Standards earn a 4.7 in comparison to other available standards. Comments from various other test sites included "very good contrast/brightness levels at all voltages used," "easy to use," and "could become my secondary standard of choice."***

### Application

EMS's MXS "CE" Series Reference Standards provide a calibrated dimension of either 300 or 700 nm nominal length. ("BE" series available only 300 nm).

- **The larger dimension provides accurate, multiple period measurement from about 5000X to over 45,000X, while**
- **The smaller dimension is useful from about 10,000X to over 100,000X.**

Throughout this magnification range, these standards provide excellent image contrast, an enormous useful calibration area, and a 3-sigma accuracy of at worst 3%, with typical values around 1%. MXS "CE" and "BE" Series Reference Standards are available as un-mounted 3x4 mm pieces to be mounted by the microscopist. Mounting one of these calibration standards is easy. The front surface of the sample and the silicon substrate are conductive. Experience indicates that there is, in general, no need to make a special effort to ground the front surface. The use of conductive silver or carbon-loaded paint, conductive epoxies, conductive tape, etc. has all been used to successfully mount "CE" Series standards.

*With EMS's MXS "CE" and "BE" Series Reference Standards, you can:*

- **Quickly check dimensional measurements by mounting one on your specimen stage;**
- **Perform periodic calibration and performance checks of your microscope;**
- **Obtain high magnification, sub-micron scale dimensional accuracy for the first time;**
- **Accurately determine dimensions from 0.3µm to 30µm all with one calibration artifacts;**
- **Analyze your images for pincushion distortion, small-scale vibration, or small magnetic field distortions.**

The accuracy of the "CE" Series allows the microscopist to use them as a secondary standard. Their accuracy and uniformity make it easy to obtain and document traceability of measurements without placing an expensive, hard to obtain, difficult to use primary calibration standard at risk of contamination or damage.

### Certification and Accuracy

MXS "CE" Series Reference Standards provides a calibrated dimension of either 300 nm or 700 nm nominal lengths. The actual dimensions of the artifact as delivered will generally not be exactly these values. Both the fabrication process determines the actual dimension and by a second, independent measurement after the calibration artifact is manufactured. The expected accuracy of the holographic technique used in the manufacturing process is ±0.1%. Unfortunately, subsequent processing steps degrade this initial accuracy, leading to the 3-sigma accuracy of 3% for the finished product. The second, independent measurement technique has an expected 3-sigma accuracy of 1% or better. Our experience is that the two measurements technique applied to a particular artifact will agree with each other to within 0.5mm.

It is important to remember that the certified dimension in an MXS "CE" and "BE" Series Reference Standard is not just at one unique position on the artifact, but is known at all locations an the standard.

### Durability and Charging Effects

EMS MXS "CE" and "BE" Series have been tested and evaluated over a broad range of operating conditions, from those found in a tungsten filament system to the highest resolution FEG system. These standards have been found remarkably durable during use, with no beam-induced distortion in the calibrated pattern after as much as one-half hour of imaging time at 50,000X and 20 kV. Charging is minimal to nonexistent, though edge effect can be seen under some conditions. The high contrast and brightness, which can be obtained using these reference standards guarantees good contamination tolerance.

**White area material:** Tungsten.

**Black area material:** Tungsten or other metal.

**Materials:** The calibration specimen consists of a silicon chip with a thin (100nm) thick polymer layer containing the pattern and a thin tungsten film over-coating the entire surface. The tungsten film varies from 20nm to 60nm in thickness, depending on the particular model.

This structure has been proven under a wide variety of beam conditions, from 30kV to sub 12 kV. Dimensions: 300nm or 700nm nominal (exact dimension will be provided with sample).

Measurements are made from leading edge to leading edge, etc. Width of individual bars and spaces is not calibrated.



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# CALIBRATION STANDARDS & SPECIMENS

## Magnification Reference Standards – SPM, AFM, SEM Calibration Standards (continued)

### 1. 301CE and MXS 701CE

The calibrated dimension is the spatial period of a series of parallel ribs running across the sample. The significant height of the ribs (>100nm) provides excellent image contrast. The top surface of the rib structures is somewhat rounded rather than completely flat. The edges of the ribs are readily discernible, with over 75% of the 3mm by 4mm sample area exhibiting an edge location variation, which is less.

#### Use and Imaging

The exceptionally clean and uniform pattern provided in an MXS 301CE and MXS 701CE standard displays few imperfections, which can be used as focusing and stigmation aids. For this reason, taking care in setting up the image before measurement is important. To assist in the set up process, an instruction sheet is provided with each standard. This sheet provides several example images, which can be used to determine if the image of the sample is correctly set up. Especially with the MXS 301CE and MXS 701CE line-space pattern standards, obtaining the proper stigmation is crucial since improper stigmation is not readily apparent when imaging a pattern of straight line. Once a proper focus and stigmation are obtained, the image can be shifted to an appropriate area and the desired measurements made.

### 2. MXS 302CE and MXS 702C

The calibrated dimension is the spatial period of a series of a 2-dimensional grid spread across the surface of the sample. This grid consists of a series of cylindrical posts rising from the surface of the sample. The significant height of the ribs (>100nm) provides excellent image contrast. The top surface of these posts is somewhat rounded rather than flat and there are also slight departures from a perfect circle in the shape of some posts. Measurement techniques must be used which take these characteristics into account. The center-to-center distance of any pair is the most accurate measurements.

#### Use and Imaging

The exceptionally clean and uniform pattern provided in an MXS "CE" series 2-dimensional calibration standard displays few large scales imperfections. For this reason, taking care in setting up the image before measurement is important. To assist in this process, an instruction sheet is provided with the standard. This sheet provides several example images, which can be used to determine if the image of the sample is correctly set up. *The characteristics of the MXS 302CE and MXS 702CE standards make them easier to image than the 1-dimensional standards.* The 2-dimensional grid facilitates setting the stigmation of the image properly. Once proper focus and stigmation are obtained, the image can be shifted to an appropriate area and the desired measurements made. Since the pattern covers the entire sample area, it is possible to make over 1,000,000 measurements utilizing the standard without using the same area twice.

#### Cleaning for "CE" Series

Cleaning is possible using dry air or other clean gases, high purity distilled or deionized water, and soft brushes. ***Rubbing with soft tissues, or any other firm physical contact, or the use of solvents, such as acetone or alcohol will damage the surface of the reference standard.***

### 3. MXS 301BE

The calibrated dimension is the spatial period of alternating lines of Titanium and Silicon. The use of two different elements provides excellent image contrast, and the titanium layer thickness is kept to 20 nm to control edge distortion effects in the SEM image. These physical characteristics make the edges sharp and readily discernable. The calibrated pattern covers the entire sample, providing over 1,000,000 measurement sites. Because the pattern is a direct recording of a laser-generated interference pattern which has been transferred into the 20 nm thick Titanium film, these calibration samples are the most accurate available.

#### Imaging and Applications

The exceptionally clean and uniform pattern provided in a EMS MXS "BE" series calibration standard displays few imperfections, For this reason, taking care in setting up the image before measurement is important. To assist in this process, an instruction sheet is provided with each standard. This sheet provides several example images, which can be used to determine if the image of the sample is correct. Once a proper focus and stigmation are obtained, the image can be shifted to an appropriate area and the desired measurements made.

The full screen image provided by a EMS calibration sample provides a unique advantage. Most calibration standards really verify accuracy of one portion of the image, while the entire screen is part of the measurement tool. With an image that fills the screen, you can quickly diagnose all types of image distortions, including problems due to vibrations, external fields, etc. A common problem is distortion caused by miss-adjusted CRT's or scanners in which the magnification in one part of the image is different from another part of the image. Such problem are easily found and corrected using these calibration samples.

#### Cleaning for "BE" Series

Titanium on Silicon produces a very durable calibration pattern. The calibration standard can be cleaned using common solvents such as acetone or alcohol, detergents, deionized water, etc. Gentle physical rubbing with soft tissues, brushes, etc., should not damage the sample. In extreme cases, cleaning by oxygen plasma is possible.

#### Specifications

| Product Data | 301CE & 701CE | 302CE & 702CE | 301BE** |
|---|---|---|---|
| Substrate | Silicon Wafer | Silicon Wafer | Silicon Wafer |
| Top Surface | 60 nm Tungsten Film | 60 nm Tungsten Film | Ti pattern on Si |
| Physical Size | 3mm x 4mm x 0.5mm | 3mm x 4mm x 0.5mm | 3mm x 4mm x 0.5mm |
| Accuracy | ± 3% | ± 3% | ± 1% |
| Nominal Dimensions | (x) | (x, y) | (x) |
| | 300nm for MXS-301CE | 300nm for MXS-302CE | 300nm |
| | 700nm for MXS-701CE | 700nm for MXS-702CE | |
| Availability or mounted* | un-mounted or mounted* | un-mounted or mounted* | un-mounted |

*There is a cost for Mounted samples, using standard aluminum pin type stubs (EMS #75200). Please call us for all mount types.

** MXS 301BE Calibration sheet provided with standard contains actual dimensions to 3 significant figures. NPL traceability is also available with at an additional cost.

Each traceable standard is individually measured in comparison with a similar specimen calibrated at PTB.

#### Ordering Information

| Application | Product | Pattern | Nominal Pitch | Material | Mounting | Catalog # |
|---|---|---|---|---|---|---|
| SEM | 701CE | Parallel Ridges | 700 nm | W-Coated Photoresist on Si | unmounted<br>mounted | **80110-71**<br>**80110-71M** |
| SEM | 301CE | Parallel Ridges | 300 nm | W-Coated Photoresist on Si | unmounted<br>mounted | **80110-31**<br>**80110-31M** |
| SEM | 702CE | Array of Posts | 700 nm | W-Coated Photoresist on Si | unmounted<br>mounted | **80110-72**<br>**80110-72M** |
| AFM, SEM, TOF-SIMS, Auger, etc. | 301BE | Parallel Ridges | 300 nm | Ti Lines on Si | unmounted<br>mounted | **80111-31**<br>**80111-31M** |

**Special Services (Needs to be added to the standard price)**

| | | |
|---|---|---|
| **SS-301** | 301BE Certification | each |
| **SS-SEM** | Mount Certified Specimen for SEM | each |

# CALIBRATION STANDARDS & SPECIMENS

## SPM Calibration Specimens

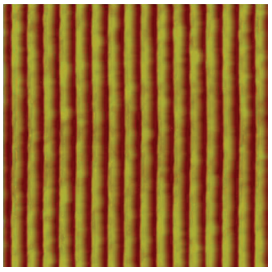
### Features and Benefits:

- Easier testing of your SPM.
- Improved accuracy of critical dimension measurements.
- Accuracy: 0.5% (1 std. dev.).
- Holographic fabrication - assures high accuracy and precision.
- Pattern height > 100nm - provide excellent image contrast.
- Uniform coverage of entire chip - save time (can image anywhere).

### Description:

**Nominal calibrated dimensions:** 300 or 700nm.
**Calibration certificate:** supplied with each sample, stating the dimension to the nearest 1nm.
**Pattern types:** 1- or 2-Dimensional. The calibrated dimension is the same for both axes for the 2-D standard.
**Feature geometry:**
-parallel ridges (1-D, 300 or 700nm)
-cylindrical posts (2-D 300nm)
-diamond-shaped posts (2-D 700nm)
**Physical Size:** 3 mm x 4 mm x 0.5mm
**Substrate:** Silicon wafer
**Top Surface:** Tungsten film

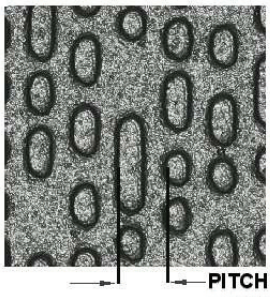
The 1-D standards can be scanned using any AFM mode, including contact mode. The 2-D standards can be scanned using modes such as Tapping Mode™, intermittent contact, and non-contact.



**Model 150-1D**

### Model 150-1D

Accurate measurements of sub 0.5 micron features are increasingly important as nanotechnology develops and as conventional microfabricated structures (semiconductors, magnetic data storage devices, optical data discs) shrinking. The model 150-1D with a nominal period (pitch) of 150nm, one dimensional, fabricated on a transparent substrate (Aluminum lines on glass) is the new tool to support this work.




**Model 750-HD**

### Model 750-HD

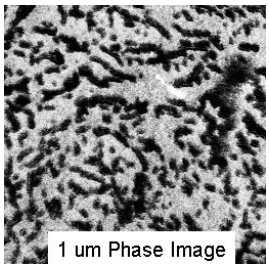
*High Durability Calibration Reference Specimen for* **AFM** *and* **STM**

Each specimen is supplied with a calibration certificate.

Can be used for AFM, STM and SEM. Has been used successfully in a hot water AFM.

**Nominal pattern dimensions:** .....Pitch 750 nm
Height 100 nm
**Nominal specimen dimensions:** .....6.35 m diam.,
0.3 mm thick
**Composition:** .....Solid Nickel

### Model PT

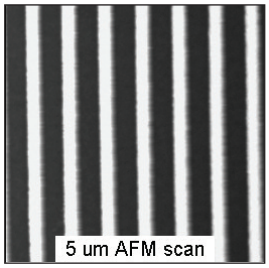



Phase Imaging Test Specimen (verify Tapping-Mode™ phase contrast and resolution). Phase Imaging is a sharp probe, which is brought into proximity with the specimen surface. The probe is oscillated vertically near its mechanical resonance frequency. As the probe lightly taps the surface, the amplitude of oscillation is reduced and the AFM uses this change in amplitude in order to track the surface topography. In addition to its amplitude, the probe motion can be characterized by its phase relative to a driving oscillator. The phase signal changes when the probe encounters regions of different composition. Phase shifts are registered as bright and dark regions in phase images, comparable to the way height changes are indicated in height images.

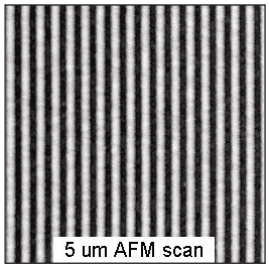
Phase images often show extraordinary contrast for many composite surfaces of technological and scientific interest. These include contamination deposits, discontinuous (i.e. defective) thin films, devices built of composite materials (e.g. magnetic recording heads), and cross-sectional specimens of composite materials. Both inorganic and organic materials can be examined. We have found that phase imaging is more convenient and gentler than other methods, which are based on contact mode operation. It routinely achieves lateral resolution of 10 nm.

### Models 300-2D, 300-1D, 700-2D and 700-1D

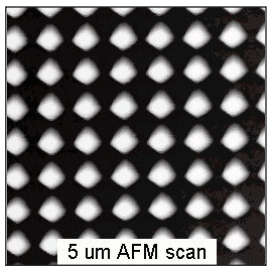
All mounted on 15 mm steel disk.



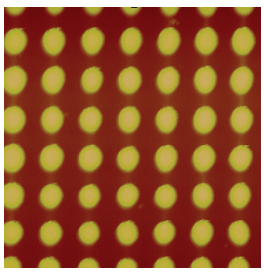

**300-1D**
Parallel Ridges, Pitch 288
W-coated Photoresist on Si
Use contact or TappingMode




**300-2D**
Array of Posts, Pitch 297
Al bumps on Si
Use contact or TappingMode




**700-1D**
Parallel Ridges, Pitch 700
W-coated Photoresist on Si
use contact or TappingMode



**700-2D**
Array of Posts, Pitch 700
W-coated Photoresist on Si
use TappingMode

**References:**
1. Pereira, D.E.D. & Claudio-da-Silva, Jr., E. "Improvement of AFM as an analytical Instrument for Residual Lignin Characterization" in: Proceedings International Symposium on Wood and Pulping Chemistry, Helsinki, Finland, June 1995.
2. Pereria, D.E.D, Chernoff, D., Claudio-da-Silva, Jr. E., & Cemuner, B.J., "The use of AFM to investigate the delignification process: Part I –AFM performance by differentiating pulping processes", to be published.



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# CALIBRATION STANDARDS & SPECIMENS

## SPM Calibration Specimens (continued)

### Model 150-2D — *Very High Reference and Traceable Standard for Resolution Calibration* AFM, SEM, Auger, *and* FIB

#### General Purpose – High Precision

A precision, holographic pattern provides accurate calibration in the horizontal plane for very high resolution, nanometer-scale measurements.

**Period:** 144 nm pitch, two-dimensional array. Accurate to ± 1 nm. Refer to calibration certificate for actual pitch.

**Surface:** Aluminum bumps on Silicon, 4x3 mm die. Bump height (about 90 nm) and width (about 75 nm) are not calibrated.

For AFM, use in contact, intermittent contact (TappingMode™) and other modes with image sizes from 250 nm to 10 mm. Available un-mounted or mounted on 12 mm steel disks.

For SEM, an independent analytical lab has tested this specimen in a FE-SEM (field emission scanning electron microscope). They found that the pattern was very uniform and the specimen was easy to image. No significant charging was observed in the voltage range 1-20 kV.

**Usability:** the calibrated pattern covers the entire chip. There is sufficient usable area to make tens of thousands of measurements without reusing any areas altered or contaminated by previous scans.

### MODEL 150-2D:

This Calibration Reference specimen comes with a non-traceable, manufacturer's certificate. These states the average period, based on batch measurements.

### MODEL 150-2DUTC:

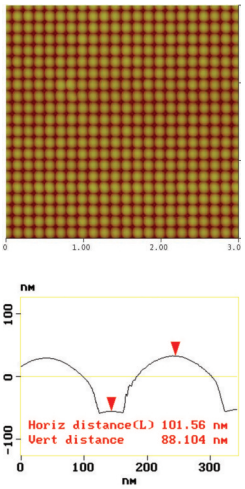
This traceable, Certified Standard is a select grade. Each standard is individually measured in comparison with a similar specimen calibrated at PTB. (PTB, Physikalisch-Technischen Bundesanstald, is the German counterpart of NIST). The uncertainty of single pitch value is typically ±1,4 nm (95% confidence interval). Multi-pitch measurements provide the usual square-root of N improvement in precision.

#### Easy to use

We recommended Model 150-2D because of its unique characteristics which make it especially easy to use. The specimen is durable and it allows you can scan in contact mode, offering you faster calibration and measurements. This is the only high resolution 2D calibration specimen we have seen that offers the following characteristics:

- **2-dimensional array for simultaneous calibration of X and Y axes.**
- **Pitch <500 nm.**
- **Array of pumps mean the image contrast is high even when the probe tip is slightly dull.**
- **High contrast in contact mode scans.**
- **The pattern covers the entire die so that you don't have to hunt for the scan area.**

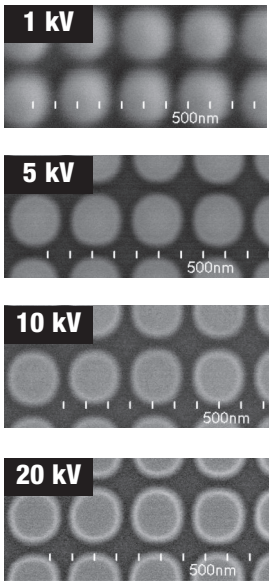
#### AFM Tapping Mode Scan




The bump height is about 90 nm. This specimen is not recommended as a height reference because it is not easy for the standard AFM probes to reach the substrate level between the pumps.

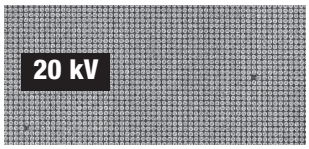
#### SEM High Magnification

The following image was captured with a magnification setting of 100kX and accelerating voltage 10 kV




#### SEM Medium Magnification

At 5 kX, the individual bumps were still well resolved. Large fields of view show how few defects are present. The most common defects are single missing bumps or a single extra bump inserted between lattice positions. Two vacancies are present in the image shown here.




#### Ordering for Calibrator only:

Available in the following ways: unmounted, 15mm steel disk(for AFM), SEM pin stub, or any other type of SEM stub.

| ASM Model# | EMS Part# |
|---|---|
| 150-1D | **80125-1D** Unmounted |
| | **80125-1D-Pin** |
| | **80125-1D-AFM** |
| | **80125-1D-X** (Choose mounting) |
| 150-2D | **80125-2D** Unmounted |
| | **80125-2D-Pin** |
| | **80125-2D-AFM** |
| | **80125-2D-X** |
| 150-2DUTC | **80126-2D** Unmounted |
| | **80126-2D-Pin** |
| | **80126-2D-AFM** |
| | **80126-2D-X** |

| ASM Model# | EMS Part# |
|---|---|
| 300-1D | **80123-1D** Unmounted |
| | **80123-1D-Pin** |
| | **80123-1D-AFM** |
| | **80123-1D-X** |
| 300-2D | **80123-2D** Unmounted |
| | **80123-2D-Pin** |
| | **80123-2D-AFM** |
| | **80123-2D-X** |
| 301BE | **80111-31** Unmounted |
| | **80111-31-Pin** |
| 301CE | **80110-31** Unmounted |
| | **80110-31-Pin** |

| ASM Model# | EMS Part# |
|---|---|
| 302-edu | **80124-EDU** Unmounted |
| | **80124-EDU-Pin** |
| 302CE | **80110-32** Unmounted |
| | **80110-32-Pin** |
| 700-1D | **80122-1D** Unmounted |
| | **80122-1D-AFM** |
| 700-2D | **80122-2D** Unmounted |
| | **80122-2D-AFM** |
| 701CE | **80110-71** Unmounted |
| | **80110-71-Pin** |
| 702CE | **80110-72** Unmounted |
| | **80110-72-Pin** |
| 750-HD | **80124-HD** Unmounted |
| PT | **80124-PT** |

# CALIBRATION STANDARDS & SPECIMENS

## Very High Resolution Calibration Reference and Traceable Standard for AFM, SEM, Auger, and FIB

*For General Purpose and Metrology Microscopes*

A precision pattern providing accurate calibration in the horizontal plane for very high resolution, nanometer-scale measurements.

**Period:** 70 nm pitch, one-dimensional array. Accurate to +/- 0.25 nm. Refer to calibration certificate for actual pitch.

**Surface:** Silicon Oxide ridges on Silicon, 4x3 mm die. Ridge height (about 35 nm) and width (about 35 nm) are not calibrated.

For AFM, use in contact, intermittent contact (TappingMode™) and other modes with image sizes from 100 to 3000 nm. Available unmounted or mounted on steel disks.

For SEM, this specimen works well at a wide range of accelerating voltages (1 kV to 20 kV have been tested) and calibrates images from 25 kX to 1000 kX. Normally supplied unmounted. Can be mounted on a stub of your choice.

**Usability:** The calibrated pattern covers a 1.2x0.5 mm area. There is sufficient usable area to make thousands of measurements without reusing any areas altered or contaminated by previous scans.

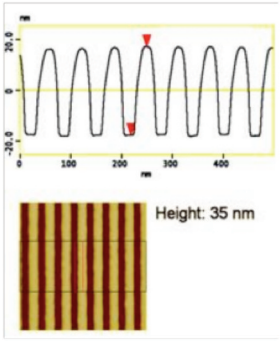
### ➤ Model 70-1D.

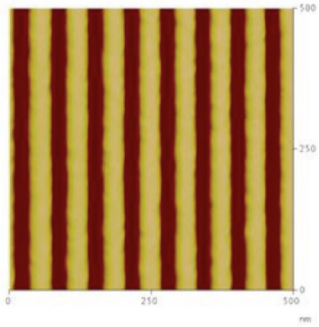
This Calibration Reference specimen comes with a non-traceable, manufacturer's certificate. This states the average period, based on batch measurements.

### ➤ Model 70-1DUTC.

This Traceable, Certified Standard is measured in comparison with a standard calibrated at PTB. (PTB, Physikalisch-Technischen Bundesanstalt, is the German counterpart of NIST. The standard is "NIST-Traceable" by virtue of the mutual recognition agreement between NIST and PTB.) The uncertainty of single pitch values is typically +/- 0.5 nm (95% confidence interval). Multi-pitch measurements provide the usual square-root of N improvement in precision.

### AFM Tapping Mode Scan



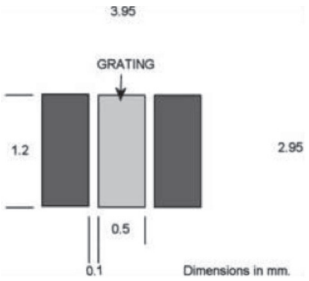



The ridge height is about 35 nm. This specimen is not recommended as a height reference because the standard AFM probes may not always reach the substrate level between the ridges. Nevertheless, the image contrast is high, even when the probe tip is slightly dull. You can scan in contact mode, which means you can calibrate and measure faster.

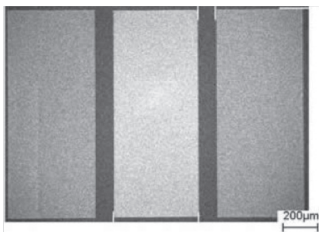
### Easy to find Patterned area

The patterned area is easy to find. The three rectangles shown in the sketch below are visible in reflected light, with either the unaided eye or an optical microscope. In a low magnification SEM image, the contrast is reversed. The central rectangle, which is the grating pattern, is relatively bright. The grating lines are parallel to the long side of the rectangle, as suggested by the high magnification SEM image.

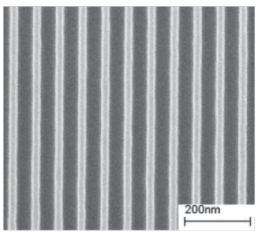
Die and location of pattern within die:




Low magnification SEM image:




SEM High Magnification Image




Magnification= 200 kX
Voltage= 5 kV.

### Ordering for the Very High Calibration and Traceable Standard:

Available in the following ways: unmounted, 15mm steel disk (for AFM), SEM pin stub, or any other type of SEM stub.

| Cat.# | Description | Qty |
|---|---|---|
| **80127-1D** | Calibration Standard, Model 70-1D Unmounted | each |
| **80127-1DC** | Calibration Standard, Model 70-1D with Cert, Unmounted | each |
| **80127-1D-PIN** | Same as 80127-1D but mounted on Pin Stub | each |
| **80127-1DC-PIN** | Same as 80127-1DC but Mounted on Pin Stub | each |
| **80127-1D-AFM** | Same as 80127-1D but mounted on Steel Disk for AFM | each |
| **80127-1DC-AFM** | Same as 80127-1D but mounted on Steel Disk for AFM | each |
| **80127-1D-X** | Same as 80127-1D, Choose Mount | each |
| **80127-1DC-X** | Same as 80127-1D Choose Mount | each |



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# Calibration Tools for Atomic Force or Scanning Probe Microscopy (AFM/SPM)

*The Tipcheck device is used for examining the shaft of the tip probe or for determining the tip breakage etc.*

## 1. TIP CHECK:

### The Problem

Imaging a new sample in an AFM, it may be difficult to know whether one has obtained an accurate representation of the surface. Even in the case that a fairly clear idea of expected feature topography exists, an independent means of assessing the influence of the probe tip on the image is desirable.

Consider the following:

- **A broken or misshapen probe tip results in inaccurate rendering of samples. Extra time from an already busy schedule can be consumed in further clarification work that wouldn't have been needed otherwise. Worse, if the tip damage goes undetected, the true topographical nature of your samples may inadvertently go unnoticed.**
- **Using microscopy techniques such as SEM to look for breakage in tips is neither convenient nor economical enough to be done routinely.**

A simple, convenient means to prescreen all of one's AFM tips is certainly desirable! You and your team can thereby save time and effort, and avoid frustration. Fortunately, there is a simple and effective means to prescreen your tips, and assess used tips as well.

### The Answer is TipCheck (TC)

TipCheck exploits reverse imaging to provide a fast and simple way to assess new and used tips without the need for SEM inspection. TipCheck helps you to categorize your tips on the spectrum at right, and permits qualitative comparisons between tips.

The microstructure of the TipCheck film is ideal for the detection of tip morphology in the vicinity of the tip apex. The AFM images shown here were obtained by imaging a TipCheck surface with (left) a broken tip and (right) a reasonably good tip.

The film is supplied on a chip of silicon, ready to be placed in your AFM. Instructions are provided with examples of images to aid you getting started with your own sample library.

| | | |
|---|---|---|
| **80130-Ti** | AFM/SPM TipCheck Calibration | each |

*The Nioprobe device is used to determine the shape at the very apex of the tip probe for microscopy measurements.*

## 2. Nioprobe

### The Problem

The physical probe used in AFM imaging is not ideally sharp. As a consequence, an AFM image does not reflect the true sample topography impartially, but rather represents the interaction of the tip with the sample surface. There is no avoiding this imperfection, which sets real limits on what may be validly inferred from an AFM image.

Whether one is engaged in detailed, quantitative metrology or is simply using AFM images as an interpretive aid, it is imperative be able to assess these limits. The key here is to possess a reliable estimate of the sharpness of the tip apex. Reverse imaging of the probe is the most convenient means of obtaining the effective radius of the probe. For this purpose, the ideal characterization sample would consist of small, stiff, spiked features.

### The Practical Answer is NioProbe (NP)

Consider the following advantages of NioProbe

- Tiny peaks densely populate the surface structure of the NioProbe film. This makes the film very suitable for the small piezo movement's characteristic of precision AFM work.
- Feature peaks exhibits imaging radii of less than 5 nm, as sharp as anything else available. This permits one to obtain the accurate apex radius desired for medium-to small-scale work (such as biomolecular imaging).
- The random orientation of the NioProbe features is suitable for applying blind tip reconstruction methods.
- The sample is resistant to the duress of contact mode scanning.
- The film is supplied on a silicon chip, ready to be placed in your AFM. Instructions are provided to allow easy determination of the apex radius. If stored in a clean, dry place, the sample can provide years of service.

| | | |
|---|---|---|
| **80130-NB** | AFM/SPM NioProbe Calibration | each |

**Fig. 1:** This image of a TipCheck surface was acquired with an unbroken, sharp, silicon nitride contact mode tip. Note the smooth planar sides of the features, the well-defined edges & peaks, and the good correspondence between the topographical image (top) and the lateral force map (bottom).

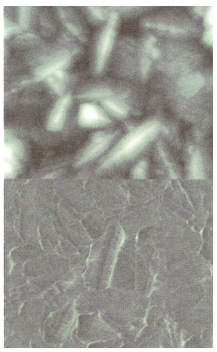


**Fig. 2:** An image acquired by a used, somewhat worn tip. Topographical features are still produced reasonably well but are not quite as sharp. The lateral force map has changed in appearance. There is no evidence of tip breakage.

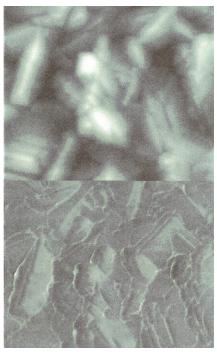


**Fig. 3:** Another image acquired by a tip duller than ideal. The tops of features are beginning to look rounded. Compared the lateral force image to that of Fig. 1.

**Fig. 4:** Another example of an image acquired by a new, unbroken tip.

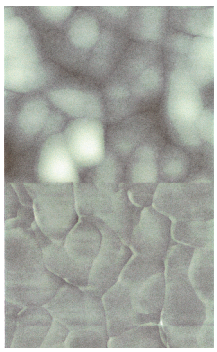
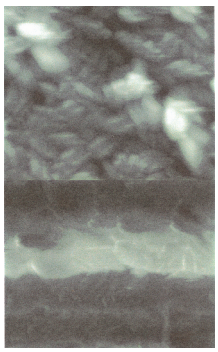


**Fig. 5:** If the tip becomes broken or severely worn, the features will appear very globular or flattened. As an initially new tip becomes wrong with use, the image quality will gradually degrade to this stage from that of Fig. 4.



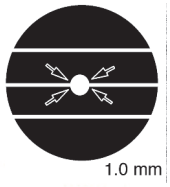
**Flg. 6:** This image was acquired with a defective tip. The doubled features throughout the scan suggest that tip apex may be notched, resulting in unwanted artifacts in images.

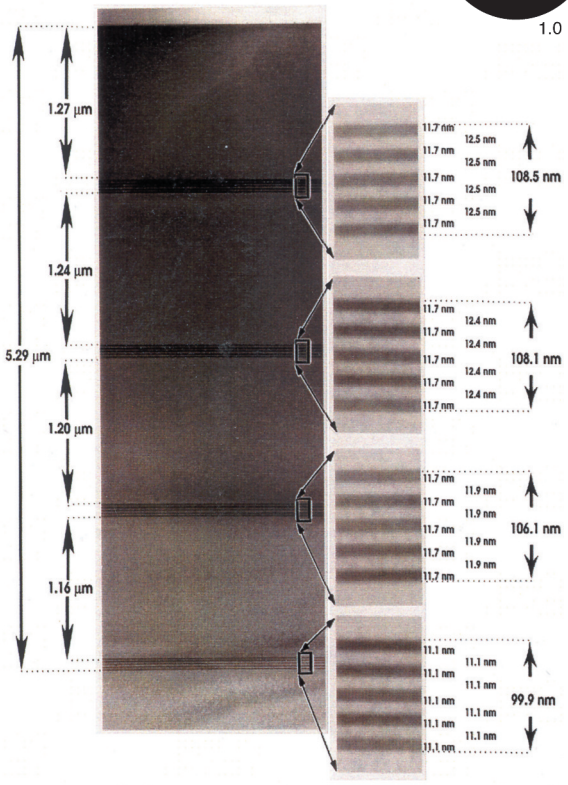
# CALIBRATION STANDARDS & SPECIMENS

## MAGICAL™ - TEM Calibration Standard

MAG*I*CAL is the world's smallest ruler and have been inducted into the Guinness Book of World Records,
A genius standard to perform the three major calibrations of a TEM:

- **Image Magnification Calibration**
- **Camera constant Calibration for Indexing Diffraction Patterns**
- **Image/Diffraction Pattern Rotation Calibration (crystal relation features)**




**MAGNIFICATION CALIBRATION STANDARD FOR TEM**
**Layer Thickness Values Surface**

MAG*I*CAL™ consists of an ion milled cross section of a silicon single crystal consisting of a series of atomically flat layers of Si and SiGe, which have been grown epitaxially by MBE (molecular beam epitaxy). When the calibration structure is viewed in a TEM, it appears as a series of light and dark layers where the layer thicknesses are accurately known. The calibrated thickness measurements of these light (silicon) and dark (SiGe) layers are based on careful TEM measurements of the <111> lattice spacing of silicon, which is visible on the calibration sample itself, and are supported by x-ray diffraction measurements. The layer spacing are designed so that the sample can be used to calibrate the entire magnification range in a TEM, from 1,000X to 1,000,000X. As the sample is also a single crystal of silicon, the calibrations requiring electron diffraction information such as the camera constant and image/diffraction pattern rotation can also be performed easily and unambiguously. One single calibration sample can therefore be used to provide all three of the major TEM instrument calibration at all magnifications and all camera lengths.

***For a complete reference and technical information on MAG*I*CAL™, see our interactive website.***

| | | |
|---|---|---|
| **80069** | MAG*I*CAL® | each |

## X-Checker™


The X-Checker was the first and remains the only complete calibration aid for SEM/EDS Systems. When time is short but you want to know how well your system is performing you need the X-Checker. Each X-Checker comes with the following:

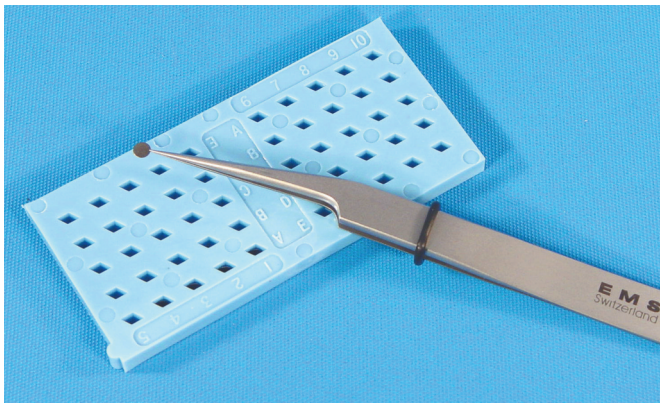
- **Manganese to measure full width at half max detector resolution**
- **Aluminum and copper to perform spectral calibration.**
- **Carbon to monitor calibration at the low end of the spectra for thin window detectors.**

You also get two grid sizes for checking the accuracy of your image analysis software and an easy test for monitoring the amount of vacuum pump oil contamination on your detector window.

- **The X-Checker™ BN comes with boron nitride for those who need a more sensitive monitor of low end performance on thin window and windowless detectors.**
- **The X-Checker™ Extra is the ultimate performance monitor for the latest state of the art X-ray detectors. In addition to the standard features and boron nitride, there is a fluorine source to test resolution at the fluorine K-alpha peak (industry standard for measuring low end resolution). As well it comes with a beryllium grid for the ultimate test of detector performance.**

| | | |
|---|---|---|
| **80058-ST** | X-Checker™, Standard | each |
| **80058-BN** | X-Checker™, With Boron Nitride | each |
| **80058-EX** | X-Checker™, Extra | each |

## TEM Checker™




TEM analysts also need to monitor the performance of their x-ray detectors. The TEM Checker contains 5 manganese disks in a standard grid storage box. Each disk is 3 mm in diameter and fits into the sample holder. The discs are not transparent to the beam but will give you a strong manganese peak to check the resolution of your EDS detector.

| | | |
|---|---|---|
| **80059** | TEM Checker™ | each |



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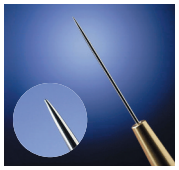
# TOOLS

## Mini-Tools; Micro-Tools

These tools are designed for anyone who is engaged in microscope work, miniature applications as well as specimen manipulation. Micro-Tools are the smallest known precision tools available for the laboratory and micro electronics industry. Micro-Tools are available in 32 different tip configurations with interchangeable handles. Micro-Tool consists of a threaded handle (MT1), and an interchangeable threaded base with tool tip. Tip material is hardened tool steel unless otherwise noted.

### Micro-Needle

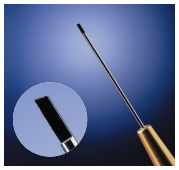
MT-01 Needle, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| **62091-01-025** | **62091-01-12** | **62091-01-25** | **62091-01-50** |

### Micro-Graver

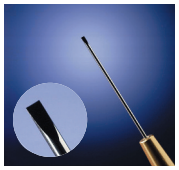
MT-02 Graver, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-02-12** | **62091-02-25** | **62091-02-50** |

### Micro-Chisel

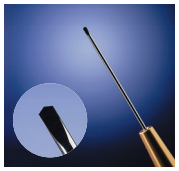
MT-03 Chisel, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| **62091-03-025** | **62091-03-12** | **62091-03-25** | **62091-03-50** |

### Micro-Spade

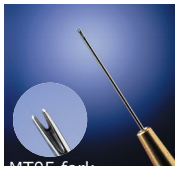
MT-04 Spade, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-04-12** | **62091-04-25** | **62091-04-50** |

### Micro-Fork

MT-05 Fork, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | **62091-05-25** | **62091-05-50** |

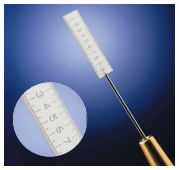
### Micro-Mirror

MT-06 Mirror, Qty: each

| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-06-50** |

### Micro-Scale

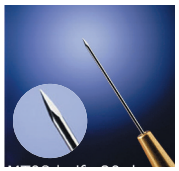
MT-07 Scale, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-07-50** |

### Micro-Knife 20˚

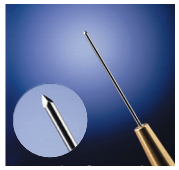
MT-08 Knife 20˚, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-08-12** | **62091-08-25** | **62091-08-50** |

### Micro-Knife 45˚

MT-09 Knife 45˚, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-09-12** | **62091-09-25** | **62091-09-50** |

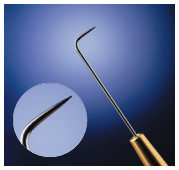
### Micro-Mirror

MT-10 Mirror, Qty: each

| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-10-50** |

### Micro-Probe 90°

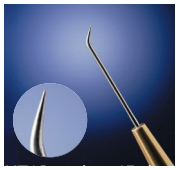
MT-11 Probe 90°, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | **62091-11-25** | **62091-11-50** |

### Micro-Probe 45°

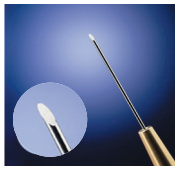
MT-12 Probe 45°, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | **62091-12-25** | **62091-12-50** |

### Micro-Graver, Oval

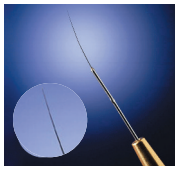
MT-13 Graver, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-13-12** | **62091-13-25** | **62091-13-50** |

### Micro-Brush

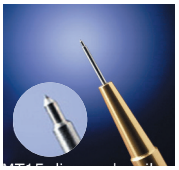
MT-14 Brush, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-14-50** |

### Micro-Diamond

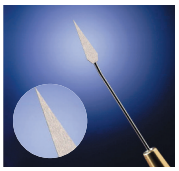
MT-15 Diamond, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | **62091-15-25** | **62091-15-50** |

### Micro-Spatula

MT-16 Spatula, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-16-50** |



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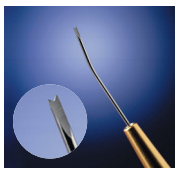
## Mini-Tools; Micro-Tools (continued)

### Micro-Manipulator

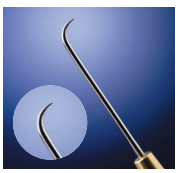
MT-17 Manipulator, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-17-50** |

### Micro-Hook 90°

MT-18 Hook, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | **62091-18-25** | **62091-18-50** |

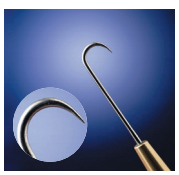
### Micro-Burnisher

MT-19 Burnisher, Qty: each

| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-19-50** |

### Micro-Hook 180°

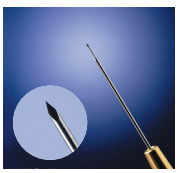
MT-20 Hook 180°, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | **62091-20-25** | **62091-20-50** |

### Micro-Scraper

MT-21 Scraper, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-21-12** | **62091-21-25** | **62091-21-50** |

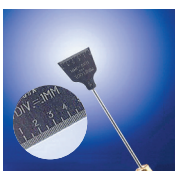
### Micro-Saw

MT-22 Saw, Qty: each

| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-22-50** |

### Micro-Scale

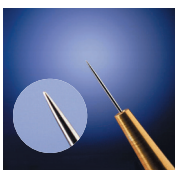
MT-23 Scale, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-23-50** |

### Micro-Needle (Short)

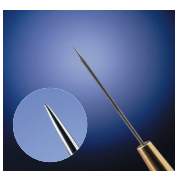
MT-24 Needle (Short), Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-24-12** | **62091-24-25** | **62091-24-50** |

### Ultra-Micro Needle

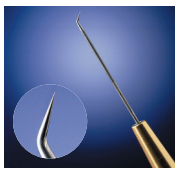
MT-25 Ultra Micro Needle, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-25-12** | **62091-25-25** | **62091-25-50** |

### Ultra-Micro Needle

MT-26 Ultra Micro Needle, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-26-12** | **62091-26-25** | **62091-26-50** |

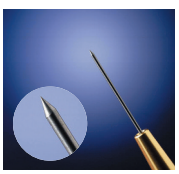
### Ultra-Micro Needle

MT-27 Ultra Micro Needle, Qty: each

| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-27-12** | **62091-27-25** | **62091-27-50** |

### Micro-Carbide Scriber

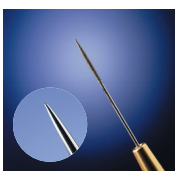
MT-28 Carbide Scriber, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | **62091-28-12** | **62091-28-25** | **62091-28-50** |

### Micro-Diamond File

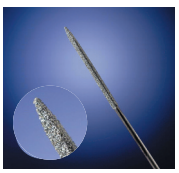
MT-29 Diamond File, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| **62091-29-025** | **62091-29-12** | **62091-29-25** | **62091-29-50** |

### Micro-Diamond File (Triangle)

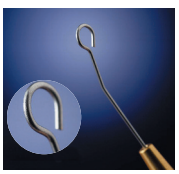
MT-30 Micro Diamond File (Triangle), Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-30-50** |

### Micro-Loop

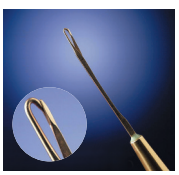
MT-31 Loop, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-31-50** |

### Micro-Hook

MT-32 Hook, Qty: each



| Cat. No. .025mm (.001") | Cat. No. .120mm (.005") | Cat. No. .25mm (.010") | Cat. No. .50mm (.020") |
|---|---|---|---|
| — | — | — | **62091-32-50** |

### Tool Handle, MT-1

Fits all Micro-Tools


| | | |
|---|---|---|
| **62090-00** | Micro-Tool Handle MT1 | each |

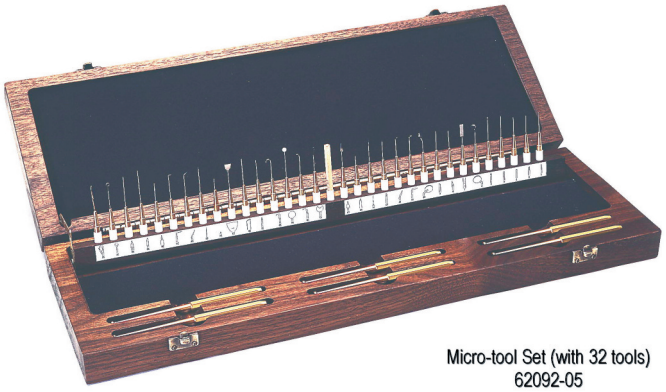
# TOOLS

## Standard Micro-Tool Set - Assorted Sets

### A. Special Lab Set 6X

A special Minitool Laboratory set 6X contains all 32 standard micro-tools (0.5mm (0.020") nominal diameter) as well as other sizes (0.25mm or 0.12mm nominal diameters), 6 interchangeable MT-1 handles and one tool sharpening stone. Each set comes with a hand-milled finished case made from solid walnut. For safety and convenience, micro-tools are placed into individual PTFE bushings in a pivoted tool rack, which automatically swings into position when the lid is opened and retracts when closed. Six tool handles are rested in milled cavities.

| | | |
|---|---|---|
| **62092-05** | Micro-Tool Lab Set 6X, 0.5mm | set |



Micro-tool Set (with 32 tools)
62092-05

**Select your own Micro-Tool Set**

All standard micro-tools (0.50mm nominal diameter) as well as other sizes, 0.25mm or 0.12mm, can be selectively ordered to make up a set of your choice. Simply select the tools you desire, add the alderwood case (if the number of tools are equal or less than 8 tools) or solid walnut case (if the number of tools are more than 8 and up to 32).
If you chose the 0.25mm diameter, tools will be shipped in a special single tool container along with a storage case and handle.

### B. Standard Micro-Tool Sets (Tool size 0.5mm diameter)

**Micro-Needle Probe Set**

This set contains :

| | | | |
|---|---|---|---|
| Tool #1 | Micro-needle, long | Tool #11 | Micro-needle, 90 degree |
| Tool #12 | Micro-needle, 45 degree | Tool #18 | Micro-hook, 90 degree |
| Tool #20 | Micro-hook, 180 degree | Tool #24 | Micro-needle, short |
| Tool #25 | Ultra micro-needle, straight | Tool #15 | Micro-diamond-scriber |
| MT-1 | Micro-tool handle | MT-case | Micro-tool storage case |

| | | |
|---|---|---|
| **62093-01** | Micro-Needle Probe Set | set |

**Micro-Cutting Tool Set**

This set contains:

| | | | |
|---|---|---|---|
| Tool #2 | Micro-graver, 3 sided | Tool #3 | Micro-chisel |
| Tool #4 | Micro-spade | Tool #8 | Micro-knife, 20 degree |
| Tool #9 | Micro Knife | Tool #13 | Micro-graver, oval |
| Tool #21 | Micro-scraper, triangular | Tool #28 | Micro-scriber, carbide |
| MT-1 | Micro-tool Handle | MT-case | Micro-tool storage case |

| | | |
|---|---|---|
| **62093-02** | Micro-Cutting Tool Set | set |

**Microscopist's Set**

This set contains:

| | | | |
|---|---|---|---|
| Tool #1 | Micro-needle, long | Tool #3 | Micro-chisel |
| Tool #8 | Micro-knife, 20 degree | Tool #15 | Micro-diamond-scriber |
| Tool #16 | Micro-spatula, flexible | Tool #18 | Micro-hook, 90 degree |
| Tool #23 | Micro-scale, 2-sided: metric & inch | Tool #25 | Ultra-micro-needle, straight |
| MT-1 | Micro-tool handle | MT-case | Micro-tool storage case |

| | | |
|---|---|---|
| **62093-03** | Microscopist's Tool Set | set |

**Placement & Manipulating Set**

This set contains:

| | | | |
|---|---|---|---|
| Tool # 5 | Micro-fork | Tool #7 | Micro-scale, 10mm |
| Tool #12 | Micro-prober, 45-degree | Tool #14 | Micro-brush |
| Tool #16 | Micro-spatula | Tool #17 | Micro-manipulator |
| Tool #18 | Micro-hook, 90-degree | Tool #26 | Ultra-micro-needle, 30 degree bent |
| MT-1 | Micro-tool handle | | |
| MT-case | Micro-tool storage case | | |

| | | |
|---|---|---|
| **62093-04** | Placement & Manipulating Tool Set | set |

## Hardwood Tool Case Only

A solid walnut hand-milled finished case. Designed to store 32 tools and 6 handles.

| | | |
|---|---|---|
| **62092-CS** | Hardwood 32-Tool Case only | each |

## Alderwood Tool Case Only

Designed to hold 8 or less micro-tools and one MT handle.

| | | |
|---|---|---|
| **62093-CS** | Alderwood 8 -Tool Case only | each |

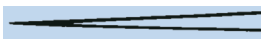


**Electron Microscopy Sciences** In PA: (215) 412-8400 • Toll-Free (800) 523-5874
Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

## Stainless Steel Micro Tools

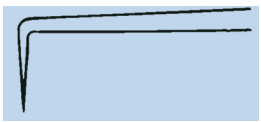
All tools are forged from the finest quality stainless steel and are precision hand ground, lapped, and polished. These tools are well suited for most applications in the field of microscopic science which demands the ultimate in precision miniature tools. Each tool may be ordered separately or in a set consisting of all 8 tools with mounted tips, one MT handle and one alderwood storage case.

62096-00



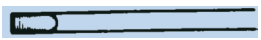
62096-01

62096-02

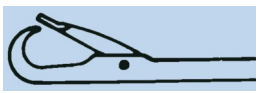


62096-03

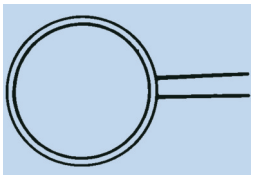
62096-04



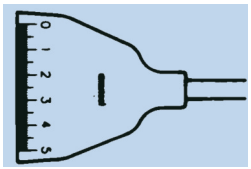
62096-05



62096-06



62096-07

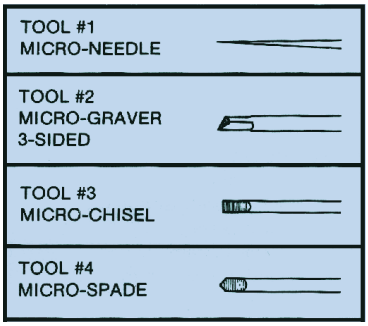


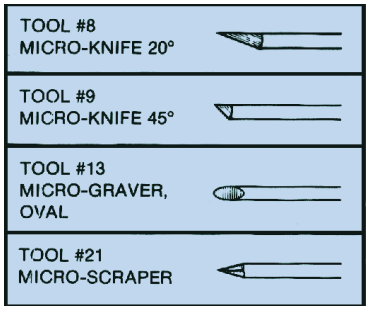
62096-08

| | | |
|---|---|---|
| **62096-00** | Complete Tool Set (8 Tools, Handle, Case) Case Tools are 0.02" (0.5mm) | set |
| **62096-01** | Micro Needle, straight Tapered from .5mm to a sharp tip | each |
| **62096-02** | Micro-Needle, bent 45 degree Bent section is 0.5mm long, sharp tip | each |
| **62096-03** | Micro-Needle, bent 90 degree Bent section is 0.5mm long, sharp tip | each |
| **62096-04** | Micro Knife, 20 degree Slanted design, 1.3mm cutting edge | each |
| **62096-05** | Micro-Chisel 0.5mm cutting width, sharp edge | each |
| **62096-06** | Micro-Hook. Guarded type, anti-snag guard, 0.3mm. ID, 1mm OD including clasp | each |
| **62096-07** | Micro Mirror. Polished stainless steel, 4.7mm diameter, 0.5mm stainless steel handle | each |
| **62096-08** | Micro-Ruler. Precision etched stainless steel with 0.5mm handle. Available in Metric or English | each |

## Carbide Micro Cutting Tools

These unique micro cutting tools are made using the latest grinding and polishing technology producing the highest quality tool on the market today. Tools are available in solid carbide with the following tip sizes: 0.5mm (.020"), 0.25mm (0.010") and 0.12mm (.005") diameter. Tool Handles are inter-changeable in tool handle MT1. Each of the tool tips and handle can be ordered separately or in sets. Standard sets come with hardwood instrument cases and include the eight tool tips listed and one handle MT1.

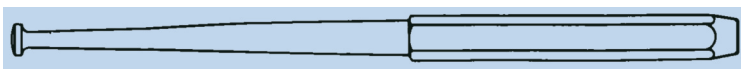



| Ordering: Description | TIP SIZES 0.5mm | 1mm | Qty. |
|---|---|---|---|
| Micro-Needle | 62094-01-50 | 62094-01-100 | each |
| Micro-Graver, 3-sided | 62094-02-50 | 62094-02-100 | each |
| Micro-Chisel | 62094-03-50 | 62094-03-100 | each |
| Micro-Spade | 62094-04-50 | 62094-04-100 | each |
| Micro-Knife 20° | 62094-08-50 | 62094-08-100 | each |
| Micro-Knife 45° | 62094-09-50 | 62094-09-100 | each |
| Micro-Graver Oval | 62094-13-50 | 62094-13-100 | each |
| Micro-Scraper | 62094-21-50 | 62094-21-100 | each |

## Tool Handle MT-79

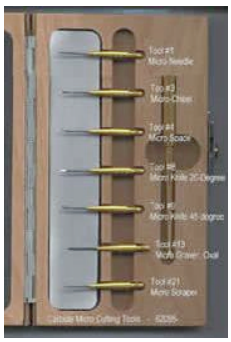
Stainless Steel Micro-Tool Handle, Made from stainless steel, 120mm long, for use with above tools.



| | | |
|---|---|---|
| **62096-HD** | Instrument Handle, MT- 79 | each |

## Assorted Carbide Tool Sets

Each set comes with a MT-1 Handle, instrument case, and 7 tips listed above (no tool #2).



| | | |
|---|---|---|
| **62095-50** | Carbide Micro-Tool Set 0.5mm | set |
| **62095-10** | Carbide Micro-Tool Set 1.0mm | set |

# RELATED PRODUCTS...

Vacuum Tools


## Pen Vac™

Pen-Vac™ is a new improved way to handle small, flat surface objects. Pen-Vac is ideal for EM work. It can be used to handle grids, pick up stubs, align membranes, work with glass slides, cover slips and much more. Holds up to one minute.

**See page 28.**

## ESD Vacuum Tool

Battery-free, hand-held vacuum designed for picking up SMD components during assembly, test and rework processes.

**See page 28.**


## Handi-Vac® Vacuum Cup

ESD-safe Handi-Vac®-2 has an improved tip designed for better lifting capacity utilizing larger, non-marking vacuum cups.

**See page 27.**

## Mini -Tool Sets

### 1. Mini Tool Set A

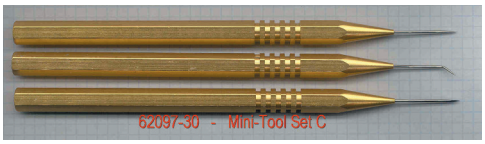
Contains eight tool tips with integrated, color-coded handles which are light-weight, non rolling and well balanced. Overall tool length is approximately 127mm (5"). Tip size is 0.8mm (.030"). Tip material is hardened tool steel, nickel plated.

**Set contains:** Straight Micro-Prober, 30° Micro-Prober, 90° Micro-Prober, Micro-Chisel, Micro-Knife, Micro-Graver, Micro-Diamond Scriber and, Micro-Measuring Scale.


| Cat. No. | Description | Qty. |
|---|---|---|
| **62097-20** | Mini Tool Set A | set |

### 2. Mini Tool Set B

Consists of three different tools: Straight Scriber with sharp tip, Sharp Triangular Scraper, Bent Prober with sharp tip - all with integrated hexagonal aluminum handles. Tip material is hardened steel, nickel plated. Tip size is 0.8mm by 25mm long. Overall length of tools is approximately 140mm (5.5")




| Cat. No. | Description | Qty. |
|---|---|---|
| **62097-30** | Minitool Set B | set |

### 3. Replacement Tools

| Cat. No. | Description | Qty. |
|---|---|---|
| **62097-11** | Replacement Scriber | 3/pk |
| **62097-12** | Replacement Chisel | 3/pk |
| **62097-13** | Replacement Knife | 3/pk |

| Cat. No. | Description | Qty. |
|---|---|---|
| **62097-14** | Replacement Triangular Scraper | 3/pk |
| **62097-15** | Replacement Oval Graver | 3/pk |

## Miniature Measuring Scales

These unit measuring scales may be used directly under a microscope or magnifier for quick measuring of small specimens, parts, grooves, slots, line widths, holes, chambers, etc. Precision fabricated from stainless steel, the scales are welded to bendable stainless steel shafts and mounted in color coded, non-rolling handles. Each scale is individually packed in a plastic tube. Overall length of the scale is 83mm (3¼"), including handle.


**1. Scale #1:** Calibrated to 0.1mm, 5mm total measurement

| Cat. No. | Description | Qty. |
|---|---|---|
| **62135-01** | Mini Scale #1 | each |

**2. Scale #2:** Calibrated to 0.005", 0.2 inch total measurement

| Cat. No. | Description | Qty. |
|---|---|---|
| **62135-02** | Mini Scale #2 | each |

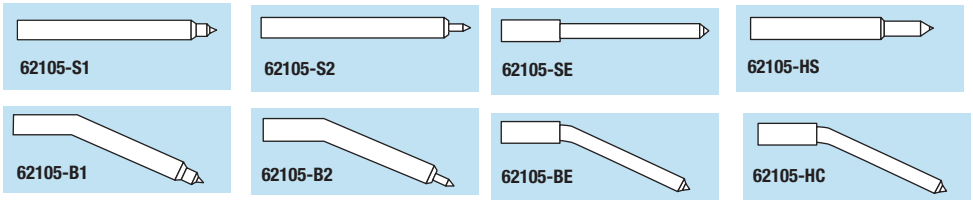
**3. Scale #3:** Calibrated to 0.1mm, 10mm total measurement

| Cat. No. | Description | Qty. |
|---|---|---|
| **62135-03** | Mini Scale #3 | each |

## High Precision Diamond Scribing Tools

A newly designed diamond scribing tool set containing eight precision natural diamond scribes in various sizes and configurations. This set is perfect for precision work in microscopy.
The set consists of eight diamond tips, 3 mm in diameter and are mounted in interchangeable tool cones and an MT-1 tool handle. The tool and handle are all housed in a hardwood instrument case. Individual scribers can be purchased separately.





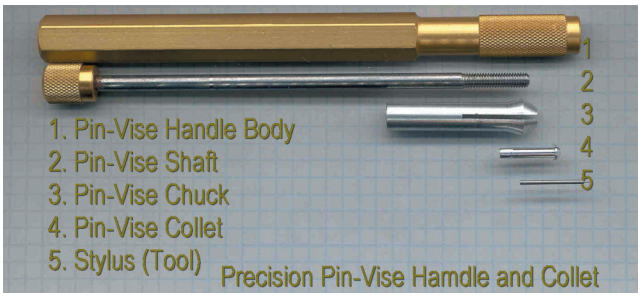

| Cat. No. | Description | Qty. |
|---|---|---|
| **62105-S1** | Straight tip, .02" (.50mm) dia. by . 06" (1.5mm) tip length | each |
| **62105-B1** | Bent tip, .02" (.50mm) dia. by .60" (1.5mm) tip length | each |
| **62105-S2** | Straight tip, .01" (.25mm) dia. by .06" (1.5mm) tip length | each |
| **62105-B2** | Bent tip, .01" (.25mm) dia. by .06" (1.5mm) tip length | each |
| **62105-SE** | Straight extended tip, .02" (.5mm) dia. by .2"(5.0mm) tip length. Good for tight areas | each |
| **62105-BE** | Bent extended tip, .02" (.5mm) dia. by .2" (5.0mm) tip length. Good for hard to reach areas | each |
| **62105-HS** | Straight, heavy duty tip, .03" (.8mm) dia. by .12" (3.1mm) tip length | each |
| **62105-HC** | Bent, heavy duty tip, .03" (.8mm) dia. by .12" (3.1mm) tip length | each |
| **62090-00** | MT-1 Tool Handle, 4.75" (112mm) long, gold anodized | each |
| **62105-00** | High Precision Diamond Scribing Tools, (8 tools & handle) | set |

## Precision Pin Vise Handle and Diamond Stylus

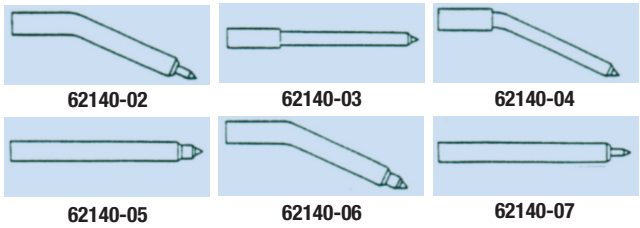
This high precision pin vise handle is machined from the finest material, non-rolling gold-anodized aluminum, which makes it lightweight and versatile. It comes complete with a precision drawbar for positive collets chuck clamping.

It features an 8mm (0.31") hexagonal barrel dimension by 100mm (4") long (overall length is 115mm fully assembled)and it has a knurled finger-grip for positive precision control for handling and tool manipulation.

The vice is supplied with a standard collet chuck opening of 2mm (0.78") diameter and will hold a selection of our specially designed tools - and collets adapter 0.8mm (0.003") for diamond stylus chucking.




| Cat. No. | Description | Qty. |
|---|---|---|
| **62140-00** | Precision Pin Vise & Collets | each |
| **62140-50** | Diamond Stylus, 0.5mm | each |
| **62140-25** | Diamond Stylus, 0.25mm | each |




Following are Diamond Scribing Tools, with a 0.80mm (0.003") diameter mounting shank, for use with above Precision Pin Vise and Collets:

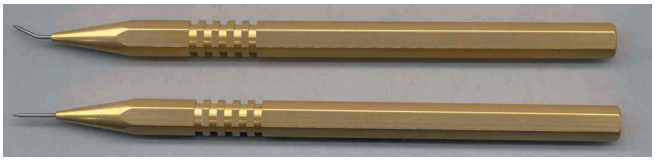
| Cat. No. | Description | Qty. |
|---|---|---|
| **62140-02** | Bent tip scriber, 0.010" (0.25mm) Diameter. 1.5mm tip length | each |
| **62140-03** | Straight extended tip scriber, 0.020" (0.50mm) diameter by 0.200"(5.0mm) tip length. This tool is a must for reaching into and in between high density components. | each |
| **62140-04** | Bent extender tip scriber, 0.020" (0.50mm)) diameter by 0.200" (5mm) tip length. Use for tight places | each |
| **62140-05** | Straight tip scriber 0.020" (0.50mm) diameter by 0.60" (1.5mm) tip length. | each |
| **62140-06** | Bent tip scriber, 0.020" (0.50mm) diameter by 0.60" (1.5mm) tip length | each |
| **62140-07** | Straight tip scriber, 0.010" (0.25mm) by 0.60" (1.5mm) tip length | each |
| **62140-60** | Set of 6 Diamond Scribing Tools and Pin Vise | set |

# TOOLS

## High Precision Fine Diamond Scriber

This diamond scriber is the ultimate scribing instrument offering the most precision for the most delicate applications. It is available in straight or bent configurations. Applications include:

- **Fine scribing under the microscope - for silicon wafers and glass coverslips**
- **Precision scribing and repairing - for thin film circuits and microcircuits, etc.**



These diamond mountings are 0.8mm diameter with a reduced shank size of 0.5mm or 0.25mm diameter, which holds the diamond stylus. The natural diamond has a 60º included angle and a 0.12mm tip radius. The integrated 6.35mm anodized hexagonal (non-rolling) aluminum handle has a positive finger grip in the form of grooves for easy control and non-slippage. Each diamond scriber is packaged in a protective plastic tube.

| Cat. No. | Configuration and Shank Size | Qty. |
|---|---|---|
| **62107-ST** | Straight Mounting, 0.5mm diameter | each |
| **62107-BT** | Bent Mounting, 0.5mm diameter | each |
| **62108-ST** | Straight Mounting, 0.25mm diameter | each |
| **62108-BT** | Bent Mounting, 0.25mm diameter | each |

## Diamond Tip Scribers/Scribers

Sturdy scribers are in wide use throughout the laboratory. It leaves a permanent marking on virtually any surface, including metal, glass, or plastic. Each Scriber features a hexagonal aluminum pencil shaped body, mill finish, natural diamond tip and protective cap. Different styles are available to fit all of your needs.


**A. Straight Head:** Overall length 6", Shank Length ⅛", Handle ¼" x 5½", 60° tip finish.

| | | |
|---|---|---|
| **70030** | Straight Tip Scriber | each |
| **70031** | Straight Tip Scriber | 6/lot |


**B. Angled Head:** Overall Length 6½", Shank 1/16" Dia. x ¼" Long, Handle ⅛" x 6" Long, 75° tip finish.

| | | |
|---|---|---|
| **70032** | Angle Tip Scriber | each |
| **70033** | Angle Tip Scriber | 6/lot |


**C. Retractable Scriber:** This is a high quality chrome pen that features appearance as well as utility. The diamond is mounted in a stainless steel tip and refills are available. The tip is finished at a 60˚ angle.

| | | |
|---|---|---|
| **70036** | Retractable Scriber | each |
| **70037** | Retractable Scriber Refill | each |

## EMS Engraving Tool

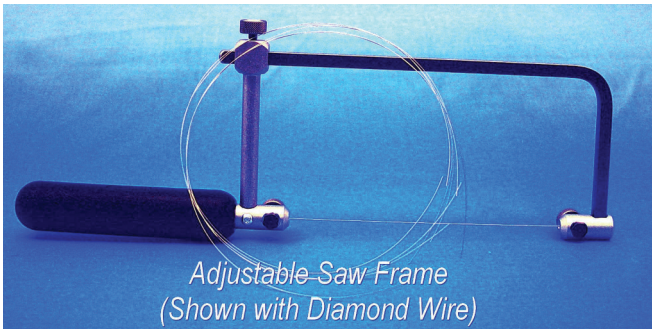
Permanently be able to mark all of your important tools and samples. The Engraver comes with a Battery Pack and is operated on two "AA" Batteries

Our EMS Engraver Engraves Test Tubes, Bottles, Racks, Keys etc as well as anything made from glass, metal, stone as well as bone . Engravings are permanent and will not disappear in the presence of chemicals and solvents. The Engraver is 7" in Height (17.8cm)

We offer a Stand for the EMS Engraver that is made from polypropylene and it measures (3½ x 3⅜").

| Cat. No. | Description | Qty. |
|---|---|---|
| **72096-01** | EMS Engraver | Kit |
| **72096-02** | EMS Engraver Tool Stand | Kit |

## Adjustable Saw Frame




A Swiss made saw frame lightweight and perfectly balanced. Its ergonomic wooden handle reduces fatigue and provides greater dexterity. Patented blade-lock design eases blade insertion and maintains perfect alignment which eliminates wobble and reduces blade loss during use. It measures 2¼ (70mm) deep and accepts saw blades up to 1.2mm diameter and 130mm long.

| Cat. No. | Description | Qty. |
|---|---|---|
| **72009** | Deluxe Saw Frame | each |
| **72009-10** | Diamond Wire | 10/pk |

## Hardened Steel Deburring Tool Set


Made from hardened steel, this tool has three razor sharp cutting edges ranging from a very sharp point to one that is approximately 10mm in length. These nickel plated triangular tools are mounted in red and black plastic handles. Tool length is 30mm by 2.1mm across (1.2"x.08"). The overall length of the tool is 154mm (5.7"). 2 tools/set.

| Cat. No. | Description | Qty. |
|---|---|---|
| **62161-SD** | Hardened Steel Deburring Tool Set | set |



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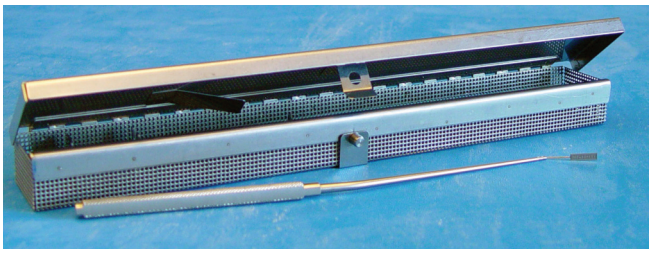
## Sapphire Burnishing/Deburring Tool


This tool will out-perform any stone for the fine burnishing of soft or hard materials such as; miniature pivots, shafts, and pins that are made from hard steel, carbide and even ceramic.
This precisely ground sapphire blade is 1.5mm x 2.3mm, 14mm long (0.06 x 0.09 x .56"). It is permanently mounted in a hexagonal gold anodized aluminum handle. Total length is 120mm (4.75").

| Cat. No. | Description | Qty. |
|---|---|---|
| 62160-00 | Sapphire Burnishing/Deburring Tool | each |

## Micro Ruler: Extended Reach

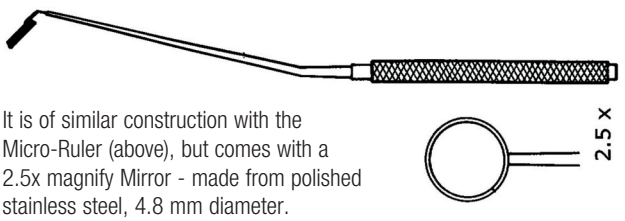


***FEATURES:***

- **Precision etched, non-glare ruler made from surgical stainless steel, only 3 mm wide. The ruler is calibrated in 0.1 mm graduations, 10 mm total range.**
- **Stainless steel handle 230 mm long. Balanced and angled for the ultimate in flexibility able to reach into areas which are impossible for other measuring devices.**
- **Available with or without a stainless steel autoclave case. Total weight of the ruler is 26 g.**
- **Applications include microscopy, chemistry and anywhere precise measurement in clean and very confined areas are of critical importance.**

| Cat. No. | Description | Qty. |
|---|---|---|
| 62136-ER | Ext. Reach Micro Ruler only | each |

## Micro Mirror - Extended Reach




It is of similar construction with the Micro-Ruler (above), but comes with a 2.5x magnify Mirror - made from polished stainless steel, 4.8 mm diameter. Overall length is 230mm

Autoclavable Case is available as an option.

| Cat. No. | Description | Qty. |
|---|---|---|
| 62136-M | Extended Reach Mirror | each |

## Micro Sieve Set

This micro-sieve set consists of a stack of four interchangeable screen-holding sections, a catch pan, and a friction-fit cover. The entire unit is molded from polypropylene. All of the parts of the set are very easy to take apart for changing the mesh insert or for cleaning. Complete with the unit are phosphor-bronzed mesh inserts in the following sizes: 25, 35, 45, 60, 80, 120, 170, and 230 mesh. The holding sections are 2" (51mm) IDx6" (152mm)H.

| Cat. No. | Description | Qty. |
|---|---|---|
| 50110-00 | Micro Sieve Set | set |

**Replacement Mesh Inserts**

A set of 8 phosphor-bronzed screen inserts in the following sizes: 25, 35, 45, 60, 80, 120, 170, and 230 mesh.

| Cat. No. | Description | Qty. |
|---|---|---|
| 50111-00 | Replacement Mesh Inserts | 8/set |

## Optical Fiber Cleaving Tools

These precision hand held tools can be used for scoring and cleaving all types of optical fibers.

### 1. Carbide Cleaver Tool

Made from a solid carbide rod. It has two angled sides which intersects into a very sharp cutting edge of about 4mm (0.160") in length. The third angle is lapped on the very tip to prevent breakage. The carbide shank is mounted into a non-rolling hexagon shaped anodized aluminum holder. The carbide part is 2.0mm dia x 10.0mm long. Overall: 120mm long

### 2. Retractable Diamond Cleaver Tool

A ground and polished natural diamond which has a v90 degree included angle with a relief angle of 30 degrees. The cleaver is retained in a quality metal pen like casing with a pocket clasp. The diamond part is 1.5mm wide x 3.0mm long. The overall length is 133mm.

### 3. Retractable Sapphire Cleaver Tool

Ground and polished natural sapphire wedge with a 60 degree included angle. The cleaver is retained in a quality metal pen like casing with pocket clasp. The sapphire part is 2.0mm wide x 3.0mm long. The overall length is 133mm

| Cat. No. | Description | Qty. |
|---|---|---|
| 62165-CC | Carbide Cleaver Tool | each |
| 62165-DC | Diamond Cleaver Tool | each |
| 62165-SC | Sapphire Cleaver Tool | each |

# TOOLS

## MicroTools for Crystallography

These patent-pending MicroTools™ have tips made from soft, flexible microfabricated polymer films. The curvature of the tips gives them rigidity, but they can still easily be flexed. Tools designed for use with samples from a few micrometers to millimeter in size. These tools will cause far less damage to fragile samples than metal tools, and they are optically and x-ray transparent.

Each tool is mounted on a 0.025"/0.64mm diameter non-magnetic stainless steel base. The base is fitted in a handle 0.7mm diameter, included in each kit. General use: for protein crystals, single cells and manipulating small samples.

### MicroTool™ Kit 1

MicroTool Kit 1 contains 20 tools for sample manipulating and measurements.

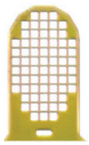
**MicroSpoon™** One each of Small, Medium, and Large sizes. Use to push, detach from surfaces, separate from a cluster, lift, and transfer. Push down to flatten tip and slide under your sample.

**MicroChisel™** One each of Small, Medium and Large sizes. Use to push, detach from surfaces, separate from a cluster, lift and transfer. Push down to flatten tip and slide under your sample.

**MicroLasso™** One each of Small and Large sizes. Use like a loop and lasso, pull and detach a sample from a surface.

**MicroTip™** One 50µm diameter tip. Use to poke, separate and lift samples. Use to reposition samples on a MicroMount or MicroMesh.

**MicroSieve™** One each of Small, Medium and Large sizes. Use to sieve samples out of solution, and to lift, transfer and soak.



**MicroGripper™** One each of Small, Medium and Large sizes. Push down onto your sample to firmly capture it, or slide underneath your sample to delicately support it. Holds crystals rigidly without damaging them for room temperature x-ray measurements.

**MicroRuler™** One 600µm wide ruler with 18µm graduation.

**MicroSaw™** Two saws. Use in conjunction with a needle to cut and remove protein skins, gel, dense lipid phases and soft tissues from around your sample.

| Cat No | Description | Qty. |
|---|---|---|
| 60100-01 | MicroTool™ Kit 1, 20 Tools | Kit |

### MicroTool™ Kit 2

We separated out the sample manipulator tools in Kit 1, modified and made them more durable. The tips of these tools are 15µm thick, so they generate more background x-ray scatter in x-ray beam than the tools in kit 1, however, still far less background compared to other sources of tools.

**MicroTip™** Two each 25 and 50 micrometer diameter tips. Use to poke, separate and lift samples. Also use to reposition sample on a MicroMount or MicroMesh. Shape is designed to minimize disturbance of surrounding liquid, while not scarifying tip rigidity.

**MicroSpoon™** Two Small and one Large sizes. Use to push, detach from surfaces, separate from a cluster, lift and transfer. Push down to flatten tip and slide under your sample.

**MicroLasso™** Two Small and Large sizes. Use like a loop and lasso, pull and detach a sample from a surface.


**MicroChisel™** Two Small and one Large sizes. Use to push, detach from surfaces, separate from a cluster, lift and transfer. Push down to flatten tip and slide under your sample.

**MicroSieve™** Two Small, two Medium and Large sizes. Use to sieve samples out of solution, and to lift, transfer and soak.

**MicroSaw™** Two saws. Use in conjunction with a needle to cut and remove protein skins, gel, dense lipid phases and soft tissues from around your sample.

| Cat No | Description | Qty. |
|---|---|---|
| 60100-02 | MicroTool™ Kit 2, 20 Tools | Kit |

### MicroTool™ Kit 3

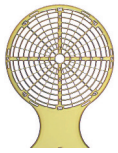
20 tools for sample measurements. Two tool for linear sample dimensions, and two for both linear and angular dimensions. Use these tools to accurately measure small and fragile samples with minimal chance of damage. Tool tips are 10µm thick and are both optically and x-ray transparent.

**Horizontal MicroRuler™** Five 500µm wide horizontal rulers with 25µm graduations.


**Vertical Microruler™** Five 1000µm long vertical rulers with 25µm graduations.

**Small MicroProtractor™** Five 320µm diameter tools for measuring angles and radial distances/dimensions, with 30º and 20µm graduations.

**Large MicroProtractor™** Five 1000µm diameter tools for measuring angles and radial distances/dimensions, with 15º and 50µm graduations. Use to measure facet angles on crystals, the major and minor axes of ellipsoidal samples, or to specify the polar coordinates of multiple samples on a single tool.



| Cat No | Description | Qty. |
|---|---|---|
| 60100-03 | MicroTool™ Kit 3, 20 Tools | Kit |



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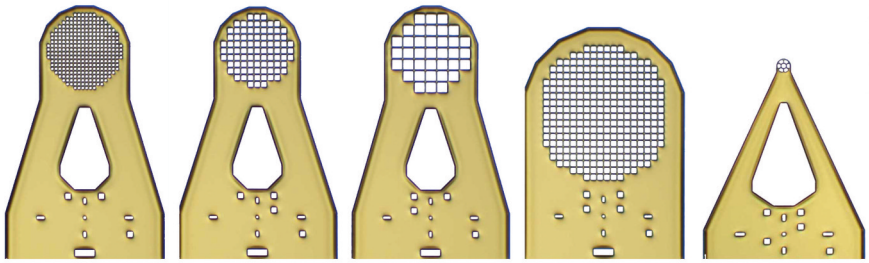
## MicroMesh™ Mounts

MicroMesh™ Mounts are the tool of choice for microcrystal crystallography and diffraction experiments, especially at micro-focus beam-lines. They have been use in de novo protein structure determination from crystals as small as 5µm. They are excellent for rods shaped crystals, and are superior to mount with elliptical apertures, because the mesh provides continuous, gentle support for rods of all sizes.



400/10 400/25 400/50 700/25 80/15

MicroMesh™ produce the smallest background scatter of any commercial mount. Their sieve-like action allows easy retrieval of sub 30µm crystals.

We offer five different sizes MicroMesh™. All are 10µm thick, with curved around tip, mounted on non-magnetic stainless steel pin as the same way as MicroMount™, producing scoop like action.

- **Three of 400 µm diameter mesh area with 10, 25, and 50 µm openings**
- **One of 700 µm diameter with mesh area with 25 µm openings.**

These four are available as single-size boxes, or in an assortment. Multiple small crystals can be retrieved and mounted together, spread out over the mesh. The diffraction properties of each crystals can be separately interrogated using a small (<100 µm) X-ray beam, so crystal heterogeneity and maximum diffraction quality yielded by a given drop's conditions can be quickly determined. This is useful in early crystallization trials when showers of crystals and precipitate are obtained.

When a drop contains many crystals, two or more crystallographic forms may be present which can differ dramatically in the quality of their diffraction. The regular grid of each MicroMesh makes it easy to match a diffraction pattern with a crystal and habit. Minimal crystals can be used.

Excess liquid can be removed using size #15 liquid wicks. Mounts can be cleaned using Medium or Fine liquid wicks.

- **The fifth MicroMesh™ Mount has an 80 µm diameter mesh area with 15µm openings.**

This small head is designed to fit entirely within the 80µm and larger X-ray beams typical of standard synchrotron beam-lines and of focused laboratory sources. Consequently, you do not have to see your tiny crystal to align it, just center the 80 µm head in the beam, and your crystal will be within it.

The smaller head also makes it easier to mount a single crystal, and produces less background scatter when the beam is aligned along the plane of the film.

### ORDERING INFORMATION

Each box contains 20 MicroMesh™ Mounts

Assortment box contain 5 each of 400/10, 400/25, 400/50, 700/25, and 800/15 MicroMesh mounts, each attached to nonmagnetic stainless steel pin. Pins are marked in 2 mm intervals, and can be cut or to your desired length.

| | Catalog Number | | | |
|---|---|---|---|---|
| **Description** | **Pin 11mm** | **Pin 19mm** | **Pin 25mm** | **SPINE** |
| Assortment Box, 20 Micromesh Mount | **60150-11** | **60150-19** | **60150-25** | **60150-S** |
| (20) 400µm Diameter, 10µm openings | **60151-11** | **60151-19** | **60151-25** | **60151-S** |
| (20) 400µm Diameter, 25µm openings | **60152-11** | **60152-19** | **60152-25** | **60152-S** |
| (20) 400µm Diameter, 50µm openings | **60153-11** | **60153-19** | **60153-25** | **60153-S** |
| (20) 700µm Diameter, 25µm openings | **60154-11** | **60154-19** | **60154-25** | **60154-S** |
| (20) 80µm Diameter, 15µm openings | **60155-11** | **60155-19** | **60155-25** | **60155-S** |

**NOTE:** to specify the pin length, substitute xx with the Pin Length: 11mm, 19 mm, 25 mm, or SP for SPINE). Example: 60150-11 for pin length 11 mm; 60153-SP for SPINE pin length.

## LV CryoOil™


Oils are widely used in crystallography – as cryoprotectants when samples are flash cooled, and as barriers to the dehydration, solvent evaporation, and oxidation, that may occur in air near and above room temperature. The ice ring seen in the diffraction pattern of flash cooled protein crystals arise primarily from crystallization of the aqueous solution surrounding the crystal, not of the internal solvent. Oils can displace and replace this surrounding solution with little risk of damage due to osmotic shock.

Substantial dehydration-induced damage can easily occur between removed from a drop and flash cooling. Dehydration can be minimized by first transferring to an oil drop (using MicroSieve™, in MicroTool kit 1 and MicroTool Kit 2) before mounting the oil coated crystal on a MicroMount or Micromesh.

However, surrounding oil scatters X-rays, reducing diffraction signal-to-noise, and contributes thermal mass that reduces crystal cooling rates and increases the need for penetrating cryoprotectants. These problems are especially acute for the smallest crystals. When mineral oil, Paratone Oil and other high viscosity oils are used, the volume of surrounding oil can exceed the crystal volume by a factor of 10 or more., and can contribute excess drag that increases sample motion in a cryostream. For larger rod or plate shaped crystals, the surrounding oil exerts stresses when it freezes that can cause crystal cracking and mosaic broadening.

LV CryoOil™ Is the best solution to your oil needs. It has the lowest viscosity of any available perfluoropolyether oil (1/10 that of Paratone oil and compatible to that of vegetable oil) and very low surface tension (less than 1/3 that of water). Consequently, a dip in this oil followed by gentle tapping to shake off excess can yield protective oil films on your crystals of as little as 10 µm thick.

LV CryoOil™ has extremely low vapor pressure, excellent chemical inert and excellent thermal stability.

LV CryoOil™ comes in each vial 1.5 ml, enough to protect hundreds of crystals.

| Cat No | Description | Qty. |
|---|---|---|
| **60166** | LV CryoOil™ | 1.5 ml |

# TOOLS

## MicroTools for Crystallography (continued)

### MicroMounts™

*MicroMounts™ are the highest performance tools for manipulating and mounting protein crystals, virus crystals, and small molecule/inorganic crystals, as well as all other small, fragile samples. They are ideal for both conventional and high-throughput X-ray crystallography applications.*

**MicroMounts™ consist of:**
A thin (7.5µm thick) micro-fabricated polyimide film, attached to a solid non-magnetic stainless steel pin. Film is wrapped around the steel pin; provides excellent stiffness and convenient scoop-like action in retrieving and handling crystals.

### FEATURES

Easy manipulating and mounting of crystals from 700µm to less than 5µm.

- **Rigid yet thin construction**
- **Convenient scoop-like design**
- **Gold hue – good mount crystal contrast**
- **Ideal for use at microfocus beamlines**
- **Complete optimization of cryoprotection and flash cooling**
- **Completely non-magnetic**
- **Low Thermal mass – rapid cooling**
- **Crystal aperture can be matched to crystal size and shape**
- **Easy removal of excess liquid**
- **Fully compatible with existing crystal mounting hardware**

### Film Pattern:

**Crystal Aperture** sizes from 10 to 600µm, with minimal width around the aperture to minimize background scatter in all orientations.

**Wicking Hole** connected via drainage channel D to the crystal aperture. Hole size is compatible with size 15 or XF paper wicks. This 'fountain-pen'-like design, allows easier removal of excess liquid, without touching the crystals with the wick.

**Alignment Cross** located a fixed distance from the center of the crystal aperture. Allow easy automated alignment of the crystal aperture

**Crystal Aperture Size Code** around the alignment cross, allows automated recognition of Mount design, aperture, and crystal size, which determines boundaries of aperture (to be avoided), required alignment tolerance, ad area of crystal available to be scanned for optimum diffraction. Initial beam size can then be automatically selected.

**Aperture Size** in µm can be read directly off the mount.

**Orientation Mark** allows the front and back of the mount to be automatically distinguished.

### Pin:

**Solid 316 non-magnetic stainless steel pins.**
Pin is available in four standard lengths: 11 mm, 19 mm, 25 mm, and SPINE. The 11, 19, and 25 mm pin lengths, give pin base-to-crystal center distance compatible to those of nylon loops mounted on 10, 18 and 24 mm pins, respectively.

This solid pin will not suck up crystal and liquid. Pin is beveled at film end, allows good visibility of the crystals for wide range of pin orientation during crystal retrieval. Pin can be cut (with cutter pliers) to any desiredlength, or can be bent to place crystal in desired orientation. Pin is fitted to all standard bases

### SPECIFICATIONS

#### Pins

| | |
|---|---|
| **Length** | 11, 19, 25 mm and SPINE lengths, marked in 2 mm intervals. |
| **Diameter** | 0.025" (0.64 mm) diameter |
| **Material** | Solid 316 non-magnetic stainless steel |
| **Pin End** | Beveled at 30º angle at each end |

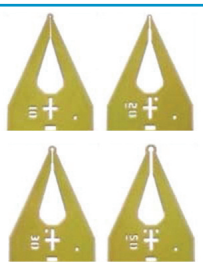
#### Crystal Holding Mount

| | |
|---|---|
| **Material** | Polyimide |
| **Crystal Aperture Sizes** | 10, 20, 30, 50, 75, 100, 150, 200, 300, 400, 500 and 600µm |
| **Thickness** | 7.5, 10 and 12.5 µm |
| **Distance from center of E to center of A** | 870 µm |
| **Distance from pin base to center of crystal aperture** | 12.1 mm (for 11 mm pins), 20.1 mm (for 19 mm pins), 26.1 mm (for 25 mm pins), 18.5 mm (for SPINE length pins) |
| **Width of Wicking Hole** | 250 µm (~ size 15 paper wicks) |
| **Length Tolerance** | 0.5 mm for 11, 19, and 25 mm pins, 0.3 mm for SPINE pins |

### ORDERING INFORMATION

1/ Assortment Boxes:

We recommend initially ordering of any assortment apertures listed below, so you can match the amount aperture to the size of your crystal. Then you order the size you use the most. You can choose pin lengths from 11, 19, 25, or SPINE. These pin pins can be cut to a desired length (using cutter pliers) or bent to your orientation.



**Small (A1),**
includes: 10, 20, 30 and 50 µm apertures

**Medium (A2),**
includes: 75, 100, 150, and 200 µm apertures

**Large (A3),**
includes: 300, 400, 500, and 600 µm apertures

| Description | Catalog Number Pin 11mm | Pin 19mm | Pin 25mm | SPINE |
|---|---|---|---|---|
| MicroMount™ Assortment Box A1 | **60110-11** | **60110-19** | **60110-25** | **60110-S** |
| MicroMount™ Assortment Box A2 | **60111-11** | **60111-19** | **60111-25** | **60111-S** |
| MicroMount™ Assortment Box A3 | **60112-11** | **60112-19** | **60112-25** | **60112-S** |



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## MicroTools for Crystallography (continued)

### MicroMounts™ (continued)

#### 2/ Individual MicroMount™

Each box contains 20 MicroMount™ with your choice of size and pin length. In general, we recommend ordering our 19mm or SPINE length pins. If you like copper post style goniometer bases and have been using 10 or 11mm pins with them, consider our B3 copper post base, which accepts full 19mm length pins.

| | | Catalog Number | | | |
|---|---|---|---|---|---|
| **Size** | **Qty.** | **Pin 11mm** | **Pin 19mm** | **Pin 25mm** | **SPINE** |
| 10µm | Box of 20 | **60115-11** | **60115-19** | **60115-25** | **60115-S** |
| 20µm | Box of 20 | **60116-11** | **60116-19** | **60116-25** | **60116-S** |
| 30µm | Box of 20 | **60117-11** | **60117-19** | **60117-25** | **60117-S** |
| 50µm | Box of 20 | **60118-11** | **60118-19** | **60118-25** | **60118-S** |
| 75µm | Box of 20 | **60119-11** | **60119-19** | **60119-25** | **60119-S** |
| 100µm | Box of 20 | **60120-11** | **60120-19** | **60120-25** | **60120-S** |
| 150µm | Box of 20 | **60121-11** | **60121-19** | **60121-25** | **60121-S** |
| 200µm | Box of 20 | **60122-11** | **60122-19** | **60122-25** | **60122-S** |
| 300µm | Box of 20 | **60123-11** | **60123-19** | **60123-25** | **60123-S** |
| 400µm | Box of 20 | **60124-11** | **60124-19** | **60124-25** | **60124-S** |
| 500µm | Box of 20 | **60125-11** | **60125-19** | **60125-25** | **60125-S** |
| 600µm | Box of 20 | **60126-11** | **60126-19** | **60126-25** | **60126-S** |

### Liquid Wicks

These paper wicks offer a great deal of absorbency with a small tip that foam-tipped or cotton-tipped applicators can not duplicate. These wicks are available sizes: 15, extra fine (XF), fine (F), and Medium (M).

Size 15 wicks fit the wicking aperture of MicroMounts, and are ideal for removing residual liquid from your crystal and mounts. Size Medium (M) and Fine (F) wicks are ideal for cleaning MicroMount

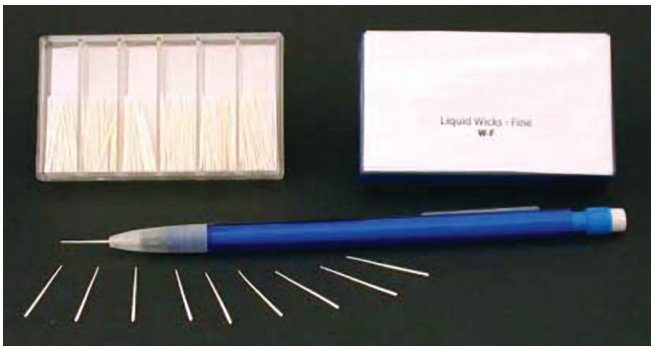
The thick end of these wicks fit into standard 0.7mm mechanical pencil.

### ORDERING INFORMATION

Each box contains 300, 28mm long high quality, tapered paper wicks.

Order size 15 and Extra Fine (XF) for removing liquid formed around your crystal.

Order sizes Fine (F) and Medium (M) wicks for cleaning MicroMounts.



| **Cat No.** | **Description** | **Qty** |
|---|---|---|
| 60160-15 | Size 15 Liquid Wicks | 300 |
| 60160-XF | Size Extra-Fine Liquid Wicks | 300 |
| 60160-F | Size Fine Liquid Wicks | 300 |
| 60160-M | Size Medium Liquid Wicks | 300 |

### MicroRT™ Room Temperature Mounting System

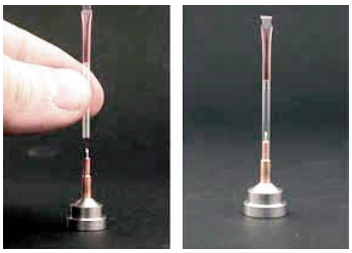
MicroRT™ is the answer for high-throughput room temperature diffraction screening and data collection. Go from crystal in a drop to crystal in the x-ray beam at room temperature in 2 minutes with 99% chance of success.

No more dealing with inadequate low temperature diffraction quality, painful glass capillary mounting methods, or difficult retrieval of crystals for low-temperature data collection.

Room temperature measurements are essential to determine whether the cause is poor as –grown crystal quality, damage caused by ligand and/or cryoprotectant soaks, and/or damage caused by the flask cooling process itself.

Our patent-pending MicroRT™ system makes collecting data at room temperature as easy as at low temperatures, and allows you to collect room and low temperature data from the same crystal.

#### How it works



First, we've replaced the standard 10µm wall glass capillaries with ultra-thin-wall transparent polyester tubing that produces 60% less background scatter. Second, we use a tubing diameter that's much larger than your crystal and MicroMount, and a base that both holds the MicroMount and captures the tubing.

To prepare the sample, just inject stabilizing liquid down into the tube toward its sealed end, using a gel-loading pipette-tip. Mount your crystal on MicroMount and insert MicroMount into the base. Thirdly, pull the tubing down over the crystal and mount onto the base.

No more cutting, crushing, and breaking. No more cracking and shattering crystals on sharp capillary edges. No more swishing crystals back and forth to position them. No more fiddling with wicks. No more wax. No more alignment problem caused by capillary/liquid lensing.

Once you have collected your room temperature frames, just pop off the tubing, plunge the MicroMount in your choice of liquid cryogen, and you're ready to collect a low-temperature data set. Or else, soak your crystal in the next solution, pop the plastic tubing back on, and repeat until you're checked out each solution or step in your protocol.

The only disadvantage is that polyester is somewhat gas permeable. You will want to keep a good sized plug of liquid in the tube and to measure your crystals within a day of mounting to make sure they do not dehydrate. If you want to store the crystals for longer, you can replace the polyester tube with any 2mm ID glass or thick wall plastic tubing.

# TOOLS

## MicroTools for Crystallography (continued)

### MicroRT™ Room Temperature Mounting System (cont.)

## FEATURES

- Ideal for both room-temperature structure determination and for diagnosing the cause of poor low-temperature diffraction
- Easy crystal mounting
- Easy collecting of both room and low-temperature data from a single crystal
- Significantly less background x-ray scatter
- Easier crystal visualization and alignment
- Accurate and reproducible crystal positioning
- Suitable for automated alignment and data collection
- One size tubing fits all.
- Tubing is reusable™.

## SPECIFICATIONS

| | |
|---|---|
| **Length** | 1.5" (38 mm) (compatible with 11 – 25 mm pin lengths) |
| **Diameter** | 0.0800" ± 0.004" (2 ± 0.1mm) |
| **Wall Thickness** | 0.001" (25 µm) |
| **Material** | poly(ethylene terephthalate) |
| **Porosity** | Water evaporation rate through wall @ 22ºC roughly 80 µg per hour |

**NOTES:** Heat seal at one end. Optically clear. Some small optical distortion is due to the small thickness variations around the circumference.

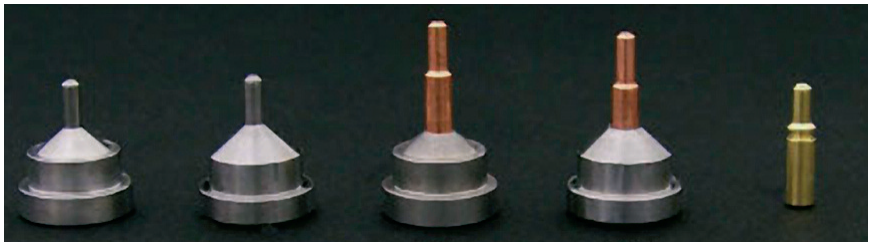
## ORDERING INFORMATION

Each bottle contains 20 1.5" (37mm) long clear polyester tubes, sealed at one end, an extra –keen razor blade for cutting the tubes to a desired length, and a tiny tube of grease for lubricating the base (see our Goniometer Bases on the next page to order MicroRT compatible bases)

| Cat No | Description | Qty. |
|---|---|---|
| **60130-T1** | MicroRT™ Tubing Kit | kit |

### Goniometer Bases

These patent pending designs Goniometer Bases are unlike other bases available on market. Goniometer Bases tightly capture the MicroRT™ tubing to allow seamless room-temperature and low-temperature data collection.



**B1** **B1A** **B2/B3** **B3A/B3S** **B4**

## SPECIFICATIONS

| | |
|---|---|
| **Materials** | 416 magnetic stainless steel (B1, B2), copper (B2, B3) and brass (B4) |
| **Base Diameter at Bottom** | B1 – B3: inside: 9.70 mm; outside: 11.95 mm; B4:3 mm |
| **Dimension of Tubing Capture Region** | Diameter: 1.93 mm, Length: 5 mm (4mm for B4) |
| **Central Hole Diameter** | 0.81 mm |
| **Central Hole Bottom-Height Above Goniometer Bead** | B1, B3: 0.043" (1.1mm); B2: 0.358" (9.1mm) |
| **Height of MicroMount Aperture Above Goniometer Head Magnet** | B1: 21 mm for 19mm pins; B2: 21mm for 11 mm pins; B3: 21mm for 19mm pins; 19.7mm for SPINE length pins |

## ORDERING INFORMATION

We offer several different base styles that are compatible with our MicroRT™ tubing and with standard cryo-tools, cryo-vials, magnetic goniometer head mounts, and most automating hardware.

- **Base B1 is available in two versions: B1 (with flat ledge) and B1A (without the ledge, for ALS-style grippers used at ALS, NSLS and CHESS)**
- **Base B2 is a copper post-style base that accepts 11/12 mm MicroMounts™. Available only with the flat edge.**
- **Base B3 is available in three versions: B3 for 19 mm MicroMount™, with the flat ledge; B3A for 19 mm MicroMount™, without the ledge; and B3S for SPINE length MicroMount™, without ledge.**
- **B4 is a 3 mm diameter "brass pin" style base, with the smaller central hole to tightly hold MicroMount™ and an extension to capture MicroRT™ tubing.**

**Base B1 – B3 are available in package of 1, 3, 6, and 20.**

**Base 4 is available in package of 20 and 100.**

***NOTE:*** *You must choose your Base when order these bases.*
*Example: 60140-01, base B1 or base B2, or Base B3, or Base B1A, or Base B3A, or Base B3S.*
*60143-03, three bases, 1 x B1 and 2 x B3; or 1x B1, 1 x B2, and 1x B3; and so on…*

| Cat No. | Description/MicroRT Compatibility | Qty. |
|---|---|---|
| **60140-01** | Type B1, B2 or B3 Base, Magnetic | 1 Base |
| **60141-03** | Type B1, B2 or B3 Base, Magnetic | 3 Bases |
| **60142-06** | Type B1, B2 or B3 Base, Magnetic | 6 Bases |
| **60143-20** | Type B1, B2 or B3 Base, Magnetic | 20 Bases |
| **60145-20** | Type B4 | 20 Bases |
| **60145-100** | Type B4 | 100 Bases |



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# CLEAVING & SCRIBING SYSTEMS AND TOOLS

**CLEAVING AND SCRIBING KITS, ACCESSORIES,** SMALL SAMPLE CLEAVER, **LATTICEAX™ CLEAVING SYSTEMS & ACCESSORIES,** FLIPSCRIBE™ SCRIBING MACHINE & ACCESSORIES, **WAFER HANDLING TWEEZERS,** PLASTIC TWEEZERS, **OMNI GRIDS**


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# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## ➤ Cleaving and Scribing Kits, Accessories

### Cleaving Kit

The complete tool set to scribe and cleave cleanly. This is a critical step to getting the best cross-sections. The kit includes two diamond scribes for marking and scribing, one pen style diamond scribe and pliers for cleaving. This kit is suitable for a wide variety of substrates and wafers (Si, GaAs, glass). The standard configuration includes one each:

- Diamond Scribe-Pen style
- Diamond Scribe-straight tip
- Diamond Scribe- 30 degree tip
- Tweezers with black soft fiber fine tip (length 6¼")
- CleanBreak Pliers-Wafer cleaving pliers.
- Clear plastic ruler with metric and US units
- Tungsten cleaving wire

**Optional Cleaving Kit with Mat**

The kit includes a large, 12x18" wafer mat.

Note: Always remember to use safety glasses when cleaving the wafer.

| Cat # | Description | Qty. |
|---|---|---|
| **7642** | Cleaving Kit | each |
| **7642-M** | Cleaving Kit with Mat | each |

### Small Sample Scribing and Cleaving Kit

Scribing and Cleaving Kit for Small Samples Includes: clear ruler with metric and imperial/US units, fine tipped sharpie for marking the sample, sample handling tweezers, pen style diamond scriber for scribing prior to cleaving, and small sample pliers for cleaving and a handy carrying case to keep all of the tools together. The small sample pliers are custom, handheld cleaving pliers for cleaving samples into pieces from 1 - 30 mm. Stainless Steel covered with plastic handles for strong grip. Soft nylon covered jaws that do not damage your sample. Good for thin and small samples. Lightweight and easy to use. Instructions included.

| Cat # | Description | Qty. |
|---|---|---|
| **7654** | Small Sample Scribing and Cleaving Kit | each |

### The Cleaving Station

The Cleaving Station includes two diamond scribes for marking and scribing, one pen style diamond scribe and pliers for cleaving, everything in the Cleaving Kit. In addition, the Lattice Scriber, customized with an 8 point diamond tip that scribes well at any angle and small sample cleaving pliers are included so that a clean cleave is always possible on samples from a few mm's to 300 mm. The standard configuration includes one each:

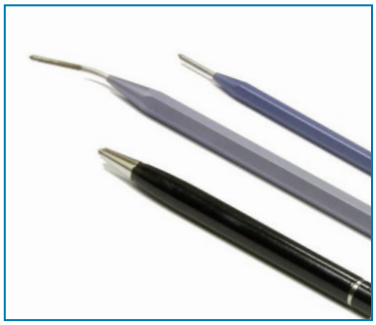
- Diamond Scribe-Pen style
- Diamond Scribe-straight tip
- Diamond Scribe- 30 degree tip
- Tweezers with black soft fiber fine tip (length 6¼")
- CleanBreak Pliers-Wafer cleaving pliers
- Small ruler mat-Self healing, Small wafer piece ruler mat
- Clear plastic ruler with metric and US units
- Tungsten cleaving wire
- One small sample cleaving pliers
- LatticeScriber diamond scriber customized with and 8 point diamond tip

**Optional Cleaving Station with Mat**

This Cleaving Station includes a 12x18" self healing cutting mat, two diamond scribes for marking and scribing, one pen style diamond scribe and pliers for cleaving, everything in the Cleaving Kit.

| Cat # | Description | Qty. |
|---|---|---|
| **7648** | Cleaving Station | each |
| **7648-M** | Cleaving Station with Mat | each |

### Marker-Scriber Kit



Diamond scribers for marking fine marks and scribing the wafer surface. These diamond scribers also serve as replacements for those purchased in the starter kit. Three diamond scribers are included:

- Pen-style diamond scriber
- Fine scriber for precise marking and/or scribing
- Fine scriber with 30 degree tip for precise marking and/or scribing

| Cat # | Description | Qty. |
|---|---|---|
| **7644** | Marker-Scriber Kit | each |



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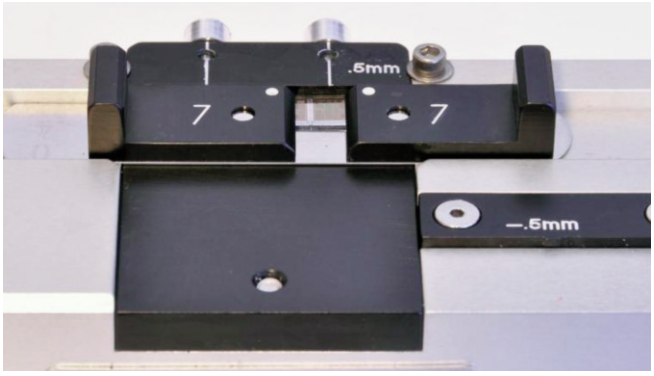
# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## Small Sample Cleaver

*Simple mechanics make the SSC an important addition to the cross section sample preparation workflow.*

Using simple mechanics, the Small Sample Cleaver (SSC) uses a novel sample holder and a cleaving platform to safely cleave samples into chips as small as 2x2mm. The novel sample holder allows samples from 4-10mm to be held during indenting and cleaving. No more handling samples directly with fingers. Gloved hands are ok, the holder has no screws, springs or pins.

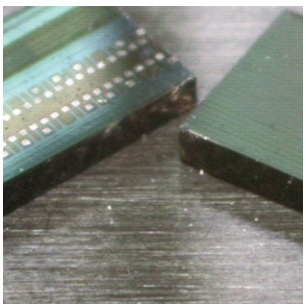

Sample on SSC ready for cleaving

### FEATURES AND BENEFITS

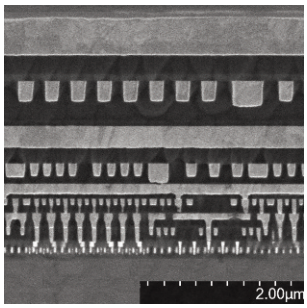
- **Easy to use**
- **Indent small samples (4-10mm) using a novel sample holder designed for use with the LatticeAx™**
- **Safely cleave samples as small as 4mm by 3mm accurately and repeatedly**
- **Repeatable cleaving of small samples without manual handling**
- **Can be operated securely with gloved hands; no more handling samples directly with fingers**
- **No more fumbling; no need for screws, springs or pins**
- **Sample hold-downs accept samples of various widths (3-15mm)**
- **Sample cleaving pins easily transfer between the indent position on the LatticeAx™ and SSC cleaving position**
- **Two cleaving pins accommodate various sample types**
- **The Small Sample Cleaver (SSC) base comes with 4 magnetic hold-downs**
- **Guage sets the sample for a 0.5mm indent (versus standard 1mm)**
- **A storage case secures all components**

### SPECIFICATIONS

| | |
|---|---|
| **Minimum Starting Sample Size** | 4mm (W) x 3mm (L) |
| **Minimum Post Sample Size** | 2mm (W) x 3mm (L) |
| **Sample Thickness Accommodated** | 200-850µm |
| **Cleaving Pin Sizes** | 0.048"/1.2mm |
| **Dimensions** | 1.14" (29.04mm) (H)<br>x 4.5" (114.3mm) (W)<br>x 2" (50.8mm) (D) |
| **Weight** | 14 oz. (396.89g) |



2 X 6 mm samples cleaved with the Small Sample Cleaver




SEM image of cross section after final polish using broad ion milling

### ORDERING INFORMATION

| Cat # | Description | Qty. |
|---|---|---|
| **7652** | Small Sample Cleaver | each |

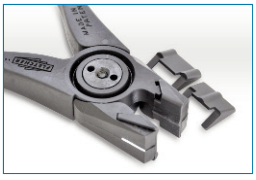
## Accessories

### Lattice Scriber

This is the best scriber you'll ever find for scribing semiconductor wafers. Lattice Scriber is the only scriber that has a 8-point truncated diamond tip that can be used for both toe and heel scribing held by a robust 4" long pin vise handle.

| Cat # | Description | Qty. |
|---|---|---|
| **7645** | Lattice Scriber | each |

### CleanBreak Pliers



CleanBreak 6" wafer cleaving pliers. Simple and clean way to cleave (post scribe) wafers and wafer strips and smaller pieces. ¾" jaw, opening. Comes with one set of replaceable jaws to maintain the best cleaving performance.

| Cat # | Description | Qty. |
|---|---|---|
| **7646** | CleanBreak Pliers | each |

### Small Sample Cleaving Pliers

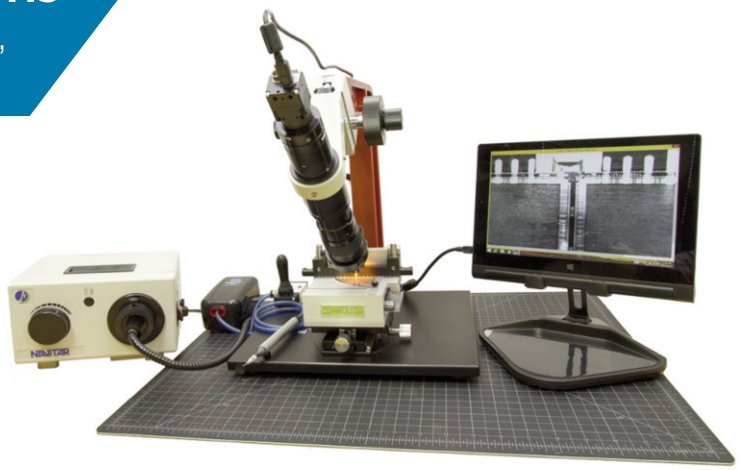
Custom, handheld cleaving pliers cleave small samples into pieces from 1 - 30 mm. Stainless Steel covered with plastic handles for strong grip. Soft nylon covered jaws that do not damage your sample. Good for thin and small samples. Lightweight and easy to use.

| Cat # | Description | Qty. |
|---|---|---|
| **7647** | Small Sample Cleaving Pliers | each |

## CLEAVING & SCRIBING SYSTEMS AND TOOLS

# LatticeAx™ Cleaving Systems

**Meet the LatticeAx™ —** the small, accurate, fast, low-cost cleaving solution, suitable for any lab.



## Overview

The LatticeAx™ is a precision cleaver that fits in the palm of your hand. In an amazingly small footprint (4" cube, 100mm³), the patent-pending "Ax" and process are designed to assist the user to cleave site specific targets, as well as wafers, strips, or pieces to precisely sized samples with localized targets. One of the smallest, most efficient silicon wafer cleaving tools in the world, the LatticeAx™ is sure to revolutionize your workflow.

Using the LatticeAx™The LatticeAx™ features and process optimizes the very basic elements of the manual cleaving technique and overcomes manual cleaving disadvantages, such as lack of accuracy and repeatability. This machine-assisted hybrid cleaving tool bridges the gap between manual scribing and fully automated cleaving. It increases success rate by any user while keeping costs down. It takes little training and users will be "cleaving in minutes and experts in a day."

### LatticeAx™ – New Way of Cleaving

LatticeAx™ is fundamentally different from manual cleaving because it

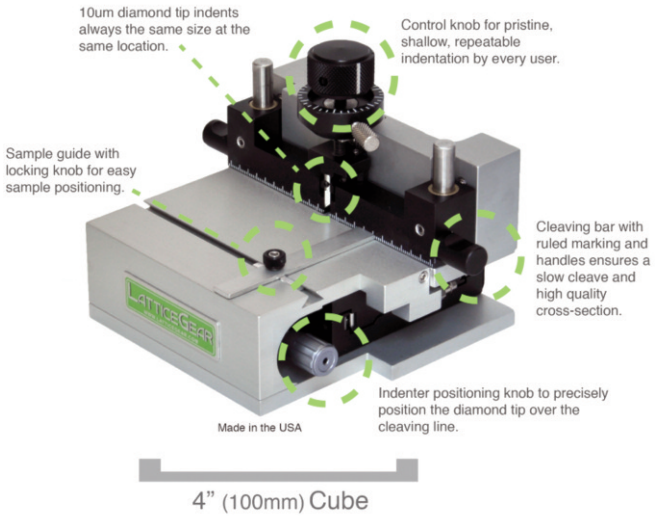
**a) Replaces human vision with a high-magnification digital microscope to precisely select the target**

**b) Replaces hand coordination with precision positioning knobs, resulting in a repeatable process that is not user-dependent**

**c) Produces an indent on the surface <1 mm in length, ~10µm in width at a very shallow depth**

**d) Employs a controlled "slow cleave" that follows the crystal plane, rather than a break along a scribed line**

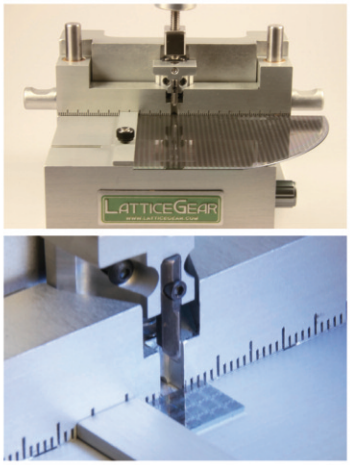
This machine-assisted hybrid cleaving tool bridges the gap between manual scribing and fully automated cleaving. It also increases success rate by any user while keeping costs down. Cleaving with the LatticeAx™ 220 and 420 products deliver 20 and 10µm targeting accuracy



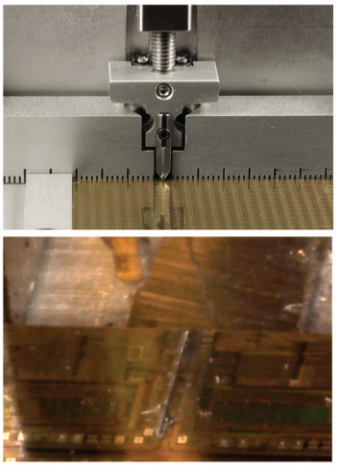

## The Process

***Using the LatticeAx™, wafer cleaving is accomplished in three basicsteps that compliment existing skill sets used in wafer analysis.***

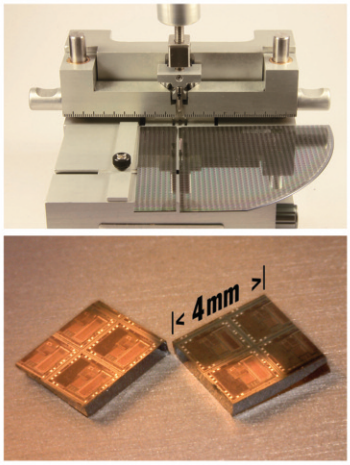
***It's simple. Just SET... INDENT... CLEAVE... RESULT***



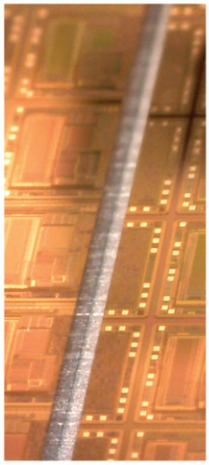

*Select target under high magnification (up to 80x) and use micrometer to position the indenter tip.*



*A precision control knob coupled with a sharp indenter tip results in fine indentation at the edge of the sample.*




*Cleaving position consists of a set cleaving pin and a cleaving bar used to apply uniform pressure to achieve a controlled cleave.*



*Cleave is always clean and precise.*



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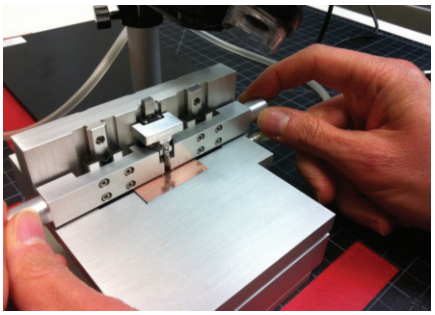
# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## LatticeAx™ Cleaving Systems (continued)



respectively. Cleaving is fast (<5 minutes), clean and repeatable.

While a manual scribe and cleave is fast (about 2 minutes), it is not repeatable or accurate. Accuracy can be improved when the manual scribe is made while viewing the sample with a stereoscope (50-100µm). In both cases, targeting accuracy and quality varies by user.

In the past decade, automated micro-cleaving tools improved targeting accuracy and sample quality needed for high resolution SEM imaging. These improvements came with strict pre-preparation requirements, lower throughput, inability to handle small and thin samples, and much higher cost than manual cleaving.

The LatticeAx™ features and process optimizes the very basic elements of the manual cleaving technique and overcomes manual cleaving disadvantages, such as lack of accuracy and repeatability.

- **Precision mechanics integrated with high resolution optics and independently controlled sample and indenter stages**
- **LatticeAx™ indents. A shallow indent is made on the surface of the sample. No scribing**
- **Clean and accurate cleaves in <5 minutes. No dust, just a straight, long cleave with a mirror finish**

### Fast – 5 Minute Process

- Quick targeting with variable zoom
- Digitally displayed real-time imaging

### Versatile – wide range of sample size, substrate type and top layers

• Si-GaAs-Sapphire • Cu • Resist • Polyimide • Passivation • Films

### Applications

- Site specific cross-section for SEM analysis
- Target localization prior to FIB or broad ion beam
- Downsize samples for SEM with height restriction
- Cleaving to create uniform samples for other analysis tools with non-wafer scale stages
- Vertical, mirror image cleaving for photonics analysis

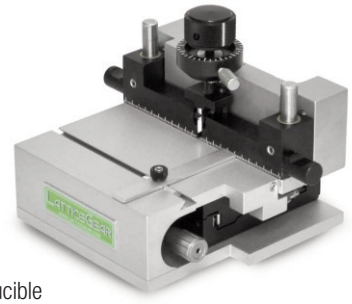
### Setup Requirements

- Flat, stable surface to support the LatticeAx™ at least 18" x 24" or 41cm x 61cm surface space
- Power for the vacuum pump (110V or 220V depending on local requirements)
- Computer running Windows 7 or XP with mouse, keyboard, monitor, video cable to the monitor

### Options

- The Cleaving Station • Cleaving Kit
- Marker-Scriber Kit • Lattice Scriber
- CleanBreak Pliers

## LatticeAx™ 120



Every user can cleave samples with wide variation of size, thickness and materials at high quality within 2 minutes.

By using the Patent Pending LatticeAx™ base platform, every user can cleave samples with wide variation in size, thickness and materials at high quality within 2 minutes. It uses precision knobs to produce fine, reproducible surface indentation followed by slow, controlled cleaving. The indenter is controlled by a stage with 5µm steps. Combine this tool with your own optical microscope to improve cleaving accuracy.

**The LatticeAx™ 120 Features:**

**Accuracy —** Determined by the scope and software you provide.

**Vision Package —** Combine this tool with your own optical microscope to improve cleaving accuracy.

**Includes:** LatticeAx™, 1 pre-installed Indenter, Vacuum Pump, Transport Case

## NEW! LatticeAx™ 225

*Accurate Indent and Cleaving System*

The addition of high magnification imaging enables accurate indenting, resulting in samples cleaved with high accuracy. The LatticeAx™ 225 delivers 20µm accuracy with high quality cleaved surfaces in 5 min. It integrates the patent pending LatticeAx™ base with an industrial platform customized for indenting and cleaving.

The imaging package includes a focusing mount, a digital microscope with polarizer and real-time image acquisition and display software. With realtime imaging the indent is placed accurately with respect to the target making cleaving sample target simple and fast for all users. The 225 accepts samples with a wide range of sizes, thicknesses and materials.

The LatticeAx™ 225 combined with the Large Sample Platform for LatticeAx™ (EMS Cat #7653) is commonly used to downsize wafers up to 300 mm. It can indent and cleave cleanly, not generating excessive silicon dust and resulting in clean edges. Because of the accuracy of the indent die can be excised without loss of material.

**The LatticeAx™ 225 Features**

- **±20 Microns Cleaving Accuracy**
- **Accurate and Repeatable Indent and Cleave**
- **Clean and high quality mirror finish cleaved face**
- **Simple to operate**
- **No maintenance contracts**

**The LatticeAx™ 225 Benefits**

- **All the features of the LatticeAx™ 120 base tool**
- **Robust workstation platform designed for indenting and cleaving**
- **USB2 digital microscope with realtime digital imaging interface***
- **Microscope mount with fine focus control**
- **Vacuum pump to secure sample with pneumatic valve switch**

*Computer not included

# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## LatticeAx™ Cleaving Systems (continued)

### LatticeAx™ 420

LatticeAx™ 420 is Electron Microscopy Sciences' highest performance cleaving solution. It integrates a custom designed, stable, small footprint workstation and vision package with 4µm optical resolution and precise focus control to cleave with 10µm accuracy in <5 minutes.

It delivers a cleaving accuracy of 10µm in <5 minutes. The patent pending LatticeAx™ base is integrated with a complete vision package that includes a monocular microscope with 4µm optical resolution, color CCD camera and real-time image acquisition and display software, as well as, X-Y stage. This dedicated cleaving workstation is used to survey, align, micro-indent, cleave, and inspect any sample by any user.

#### The LatticeAx™ 420 Features

**Accuracy —** 10µm

**Vision Package —** A Navitar Zoom 12X monocular microscope with continuous zoom (.58-7X) and fine focus coupled with an ultra-compact UXGA 1600x1200 pixel color USB CCD camera with image display software*. The package also integrates a robust, coarse and fine focusing mount and fiber optic ring lighting.

**LatticeAx™ 420 Package:**

- LatticeAx™
- 1 pre-installed Indenter
- Vision package*
- Robust setup integrated into a single platform: 11x13" heavy duty work-surface with coarse/fine focus, X-Ysample positioning stage
- Vacuum Pump

**Voltage —** 110 or 220. Price varies, so please specify when requesting a quote.

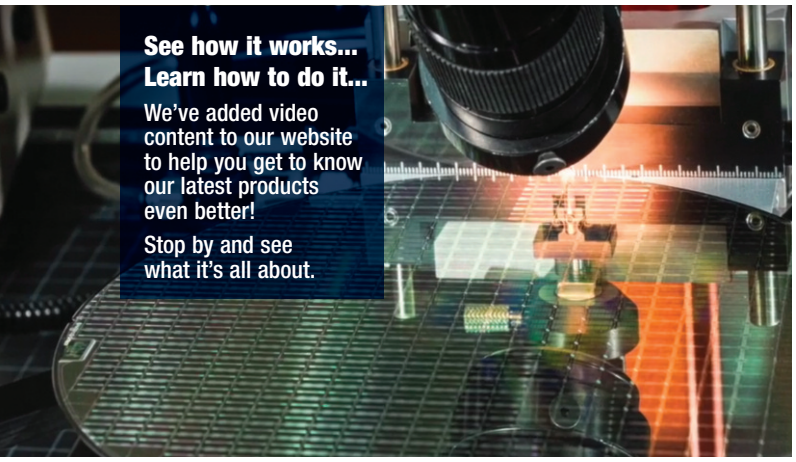
*Computer not included

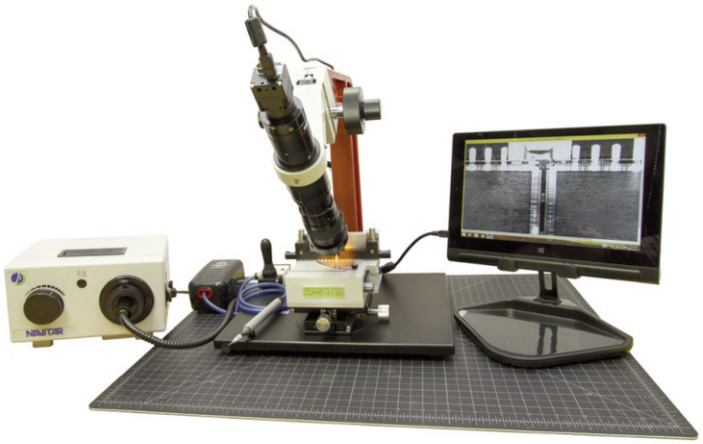
#### Every LatticeAx™ Features

**Set Samples —** Flat stage with vacuum to hold the sample in place during indentation.

**Indentation —** Using the indenter knob, create a pristine, controlled surface indentation: L-1mm (from leading edge), W- 10um, D- shallow / user selection.

**3-Point Cleaving Process —** Using the cleaving bar and turning knob, cleave slowly and controllably perpendicular to the primary sample axis, from the indentation.

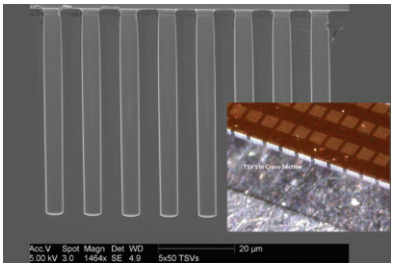


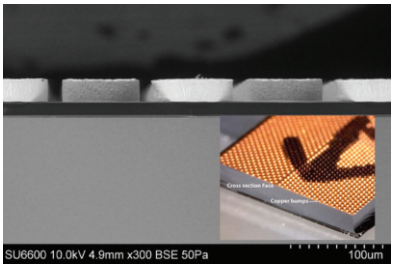
**Minimum Sample Size —** Full set-indent-cleave – minimum 9mm width / For <9mm, use the Ax to set-indent

**Maximum Sample Size —** ½ of 12" wafer

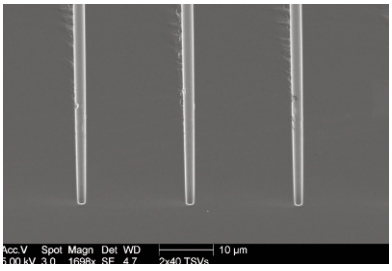
**Thickness of Sample —** 'Out of the package' die to a fully processed sample (not including package material)



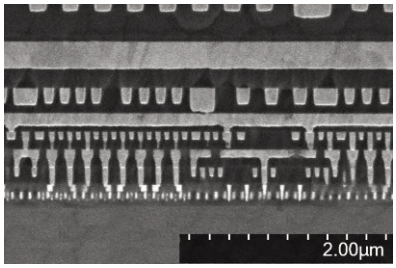
**Site-Specific Cleaving of Etched TSVs**
Cross section of SEMATECH 5x50 micron TSVs.
A single tool (LatticeAx) process was used to simply cleave through the etched vias and the image in the SEM without any other preparation.




**Cleaving Accurately Flip Chip Copper Bumps**
A multi-tool process was used to prepare cross sections of copper bumps. The LatticeAx was used to cleave close to a specific row of copper bumps for quick, final broad argon ion beam milling.




Scanning electron microscope (SEM) view of 2x40 µm etched TSVs. Sample was prepared using LatticeAx.




Sample prepared by cleaving with LatticeAx followed by 2 minutes cleaning using a broad ion mill.



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# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## LatticeAx™ Cleaving Systems (continued)

### Accessories for LatticeAx™

#### Small Sample Cleaver

*Safely cleave samples into chips as small as 2x2mm*


The novel sample holder allows samples from 4-10mm to be held during indenting and cleaving. No more handling samples directly with fingers. Gloved hands are ok, the holder has no screws, springs or pins.

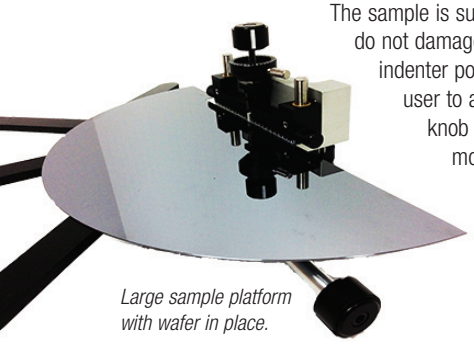
***For more information, see page 119.***

#### Large Sample Platform for LatticeAx™

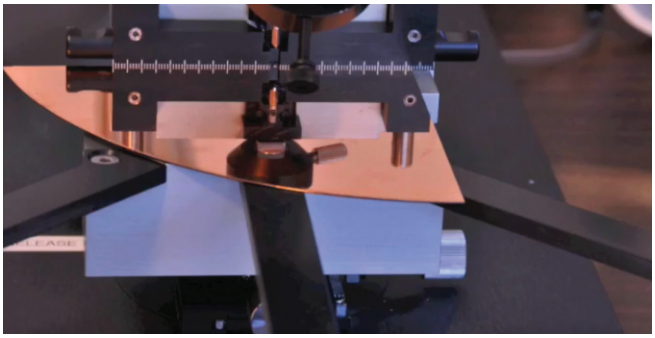
- **Begin your sample preparation with a "clean" edge**
- **Extend LatticeAx™ cleaving to 300mm diameter wafers**

The Large Sample and Whole Wafer Cleaving Accessory (LSPL) supports samples up to 300mm during indenting and cleaving. The LSPL fits on all LatticeAx™ models. This accessory easily attaches to the LatticeAx™ with a single set-screw.

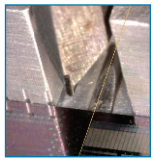
The sample is supported by four delron arms that do not damage the backside of the wafer. The indenter position extender knob allows the user to access to the LatticeAx positioning knob even with a large sample mounted so fine positioning of the diamond indenter is possible.



*Large sample platform with wafer in place.*

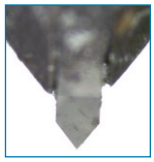


#### LatticeAx™ Diamond Indenter



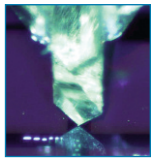
Custom diamond indenter for the LatticeAx™. The LatticeAx™ indenter is easily replaced by the user and comes with screws, allen wrench and installation instructions. Polished end for improved positioning.

#### LatticeAx™ High Angle Diamond Indenter



Standard 1 mm indent. Polished end for improved positioning. Indenter is has a 60 degree angle and is used for applications that routinely require cleaving targets with ultra high accuracy.

#### LatticeAx™ "Short" Indent-Diamond Indenter



Used when targets are close to the sample edge or the sample is fragile (thin) or small. It is installed in the same shank as the standard indenter.

#### LatticeAx™ Complete Options Package

Make sure you have everything to set up your cleaving workflow. This package includes 2 spare LatticeAx diamond indenters and everything necessary for cleaving large substrate, wafers and pieces.

- **The LatticeAx™ Diamond Indenter:** The LatticeAx Indenter is replaced by the user and comes with allen wrenches and installation instructions.
- **Cleaving Kit:** The complete tool set to get from wafer to cleanly cleaved pieces. This is a critical step to getting the best crosssections. The kit includes wafer mat, scribes for marking and scribing, pliers for cleaving, rulers and instructions.
- **Diamond Scriber:** Pen style, optimal for top down scribe
- **Diamond Scriber:** Straight tip, optimal for top down precise marking and/or scribing
- **Diamond Scriber:** 30 degree tip, optimal for top down precise marking and/or scribing
- **L-Square:** 24" x 8½", phenolic, non-warping, ruler acts as guide for macro cleaving up to 300mm wafers without damaging the top surface of the cleaving station
- **CleanBreak Pliers:** 6" wafer-cleaving pliers. Simple and clean way to cleave (post scribe) wafers to strips and smaller pieces. ¾" jaw
- **Large Cutting Mat:** Wafer-cutting mat, self healing, double sided, green and black, 18" x 24"
- **Small Ruler Mat:** Self healing, Small wafer piece ruler mat, double sided, green and black, 3½" x 5½"

## ORDERING INFORMATION

| Cat # | Description | Qty. |
|---|---|---|
| **7640** | LatticeAx™ 120 Cleaving System | each |
| **7641** | LatticeAx™ 225 Cleaving System | each |
| **7650** | LatticeAx™ 420 (110V) Cleaving System | each |
| **7651** | LatticeAx™ 420 (220V) Cleaving System | each |
| **7652** | Small Sample Cleaver | each |
| **7653** | Large Sample Platform | each |
| **7643** | LatticeAx™ Diamond Indenter | each |
| **7655** | LatticeAx™ High Angle Diamond Indenter | each |
| **7656** | LatticeAx™ Short" Indent-Diamond Indenter | each |
| **7649** | LatticeAx™ Complete Options Package | each |

# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## FlipScribe™ Scribing Machine

FlipScribe™ takes scribing to a new performance level, making clean, straight scribe lines on the back side to accurately cleave front side targets, bonded wafers and other substrates. This method eliminates contamination of sensitive front side devices during the scribing processes and is valuable for both crystalline and amorphous samples.

### Scribing Reinvented

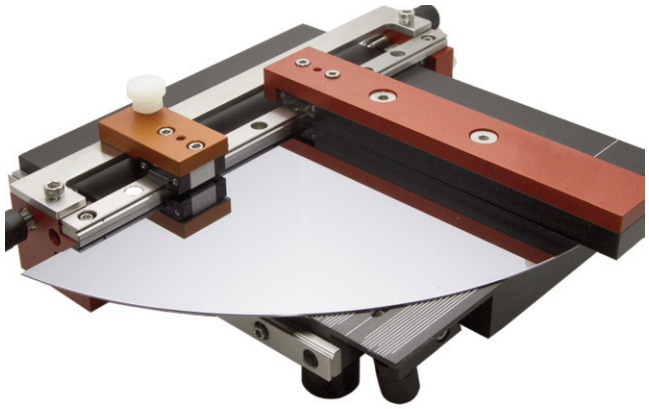
FlipScribe is a compact, stable, accurate, fast and low cost scribing and cleaving solution suitable for any lab; no utilities required. It provides a more accurate method for scribing than can be achieved with hand held tools, by integrating a robust diamond scribe into a sample platform with a fence guide design. Time required to align and scribe is about a minute. It allows users to accurately position the scribe mark relative to features on the front side, visualized either by eye or with a user-supplied high magnification microscope. FlipScribe also offers a quick method for cleanly downsizing large samples, with a "scribe stop" to allow the operator to define the length of the scribe.

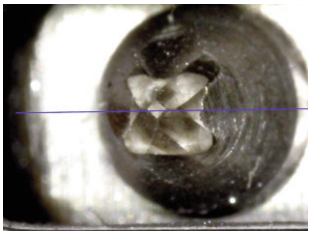
### BENEFITS

- **Enables accurate cleaving through frontside targets with a scribe made on the backside of the substrate**
- **Scribe does not damage the frontside of the sample**
- **Accuracy of scribe ±200 µm (achievable)**
- **Flexible with respect to sample size and shape**
- **Capable of scribing bonded crystalline and amorphous wafers and chips for subsequent cleaving**
- **No maintenance required**

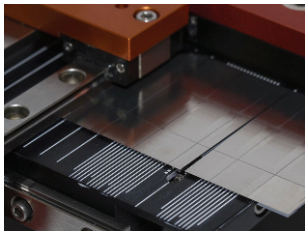
### FEATURES

- **Accurate positioning of the scribe relative to features on the front side (the front side being observed either by eye or with a stereoscope)**
- **The length of the scribe can be varied from 1 mm to 100 mm**
- **Prealigned diamond scribe in user replaceable cartridge; height and angle adjustable**
- **Ruler embedded in platform enables precise and repeatable sample alignment and sizing**
- **The tool is purely mechanical; no power required**





*Faceted diamond scribe; blue line across cutting edge*



*Silicon device after scribing and cleaving*

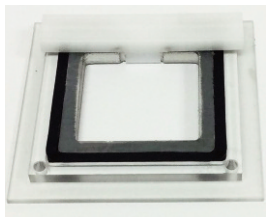
### ACCESSORIES

*FlipScribe™ shown with Cleaving Kit Extension and Wafer Holder.*

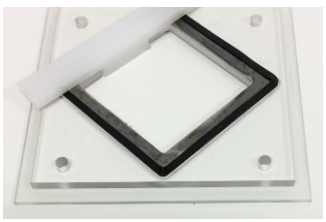
#### Cleaving Kit Extension for FlipScribe

Attaches to FlipScribe rails. The FlipScribe extension is an L-shaped bracket used to support wafer holders and large samples during the scribing process.

**7670-07** Cleaving Kit Extension for FlipScribe

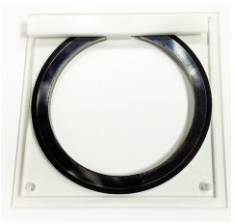


**7670-02** 1.5" Square Holder

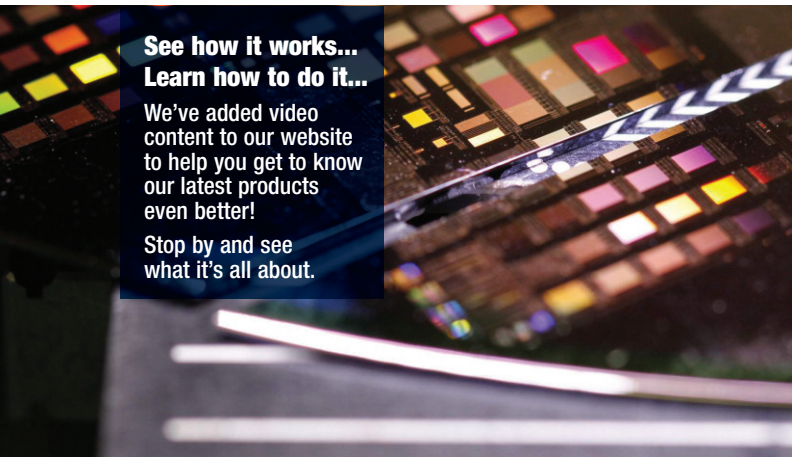


**7670-03** 45 Degree Holder With Sample

**7670-04**
2" Round Wafer Holder
**7670-05**
3" Round Wafer Holder
**7670-06**
4" Round Wafer Holder



**7670-01**
FlipScribe Replacement Cartridge



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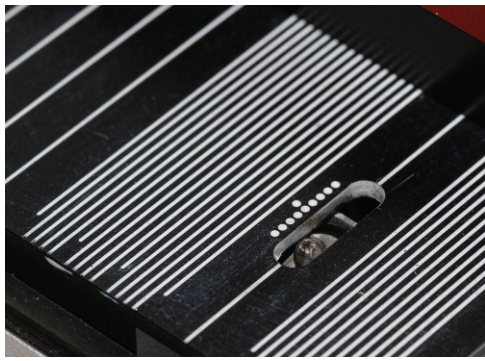
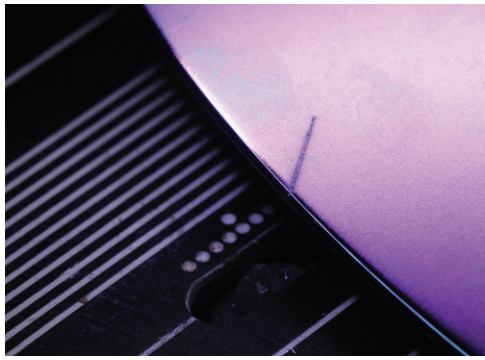
# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## FlipScribe™ Scribing Machine (continued)

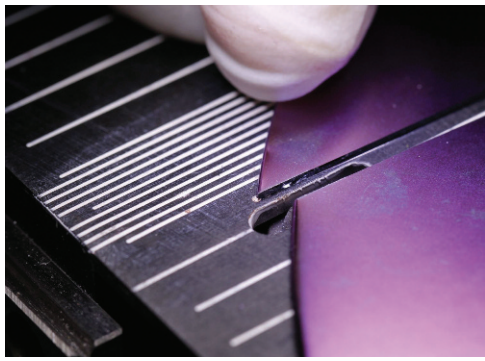
*FlipScribe has a small footprint, allowing it to be placed on any work surface.*

scribing area showing ruler



straight-line scribe on curved part of wafer



cleaved wafer

## SPECIFICATIONS

| | |
|---|---|
| **Cleaving accuracy** | ± 200 µm |
| **Cleaving cycle time** | 1-2 minutes |
| **Minimum sample size** | ⅜"/9.5 mm (L) x ¼"/6.3 mm (W) x .01"/300 µm (H) |
| **Maximum sample size** | 4" (100 mm) wafer; ¼ of 12" (300 mm) wafer;<br>Non-wafer: ⅜"/9.5 mm (L) x ¼"/6.3 mm (W) x .01"/300 µm (H) |
| **Configuration** | |
| **Rail and guide system** | Maintains sample orthogonality and method to push the sample when scribing. |
| **Sample platform** | 7" (178 mm) x 6" (152 mm); ruled to facilitate sample sizing |
| **Scribe stop** | Sets the length of the scribe; continuously variable >1 mm - 4" (102 mm) |
| **Diamond scribe** | Pre-installed diamond scriber with an eight (8) point diamond tip tool and 4 facets at 45° angle. |
| **Installment Requirements** | |
| **Flat work surface** | No power required. Stereo microscope with parfocal zoom recommended |
| **No assembly required** | |
| **Options** | |
| **LatticeAx™** | LatticeAx™ cleaving machine for analysis-ready samples with accuracy to ±10 microns |
| **Small sample cleaver** | Cleaver for small samples, includes sample holders and cleaving apparatus |
| **Cleaving kit** | Cleaving kit including pliers and scribers |

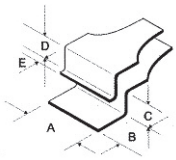
## ORDERING INFORMATION

| | | |
|---|---|---|
| **7670** | FlipScribe | each |
| **7670-01** | FlipScribe Replacement Cartridge | each |
| **7670-02** | 1.5" Square Holder | each |
| **7670-03** | 45 Degree Holder With Sample | each |
| **7670-04** | 2" Round Wafer Holder | each |
| **7670-05** | 3" Round Wafer Holder for FlipScribe | each |
| **7670-06** | 4" Round Wafer Holder for FlipScribe | each |
| **7670-07** | Cleaving Kit Extension for FlipScribe | each |

# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## Wafer Handling Tweezers

### EMS Wafer Handling Tweezers




These tweezers are especially designed for the handling of delicate and fragile silicon wafers, scintillation discs, glass slides, coverslips etc. Made from antimagnetic/anti acid steel with a very smooth surface and a non-glare finish.

#### Style 2W

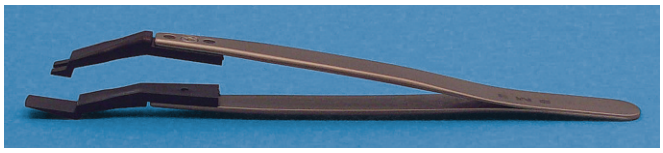
A: 6.5mm (0.25"); B: 5.0mm (0.20"); C: 2.5mm (0.10"); D: 4.0mm (0.15")

| | | |
|---|---|---|
| **78410-2W** | EMS 2W | each |


#### Style 2WFCPR

Tips are made of PEEK/CF30.These tips offer gently holding wafers. Replacement tips are available. A: 0.25" (6.6mm); B: 0.41" (2.0mm); C: 0.08" (2.0mm); D: 0.14" (3.5mm); E: 0.18" (4.5mm)

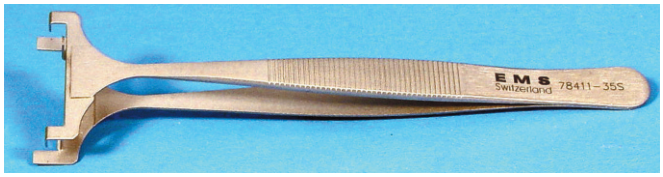
| | | |
|---|---|---|
| **78410-2WFC** | EMS 2WFCPR | each |
| **78410-2WFR** | Replacement tips set | set |



#### Style 35S

A: 29.0mm (1.14"); B: 5.5mm (0.20"); D: 3.0mm (0.12")

| | | |
|---|---|---|
| **78411-35S** | EMS 35S | each |




#### Style 38FG

A: 9.5mm (0.37"); B: 11.0mm (0.34"); D: 4.0mm (0.15"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78411-38FG** | EMS 38FG | each |


#### Style 3 WF

A: 9.5mm (0.37"); B: 10.0mm (0.39"); C: 2.5mm (0.10"); D: 4.0mm (0.15"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78411-3WF** | EMS 3WF | each |


#### Style 39S2

A: 6.5mm (0.25"); B: 8.5mm (0.33"); D: 5.5mm (0.20"); E: 2.4mm (0.09")

| | | |
|---|---|---|
| **78412-39S2** | EMS 39S2 | each |

#### Style 39S3

A: 9.5mm (0.37"); B: 8.5mm (0.23"); D: 5.5mm (0.20"); E: 2.4mm (0.09")

| | | |
|---|---|---|
| **78412-39S3** | EMS 39S3 | each |

#### Style 41W

A: 28.0mm (1.1"); B: 12.0mm (0.47"); D: 5.0mm (0.20"); E: 5.0mm (0.2")

| | | |
|---|---|---|
| **78414-41W** | EMS 41W | each |


#### Style 43 WFG

A: 9.5mm (0.37"); B: 8.5mm (0.33"); D: 3.5mm (0.14"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78414-43WFG** | EMS 43WFG | each |


#### Style 44 WF

A: 12.0mm (0.47"); B: 8.5mm (0.33"); D: 3.5mm (0.14"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78414-44WF** | EMS 44WF | each |

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## EMS Wafer Handling Tweezers (continued)

### Style 4 WF

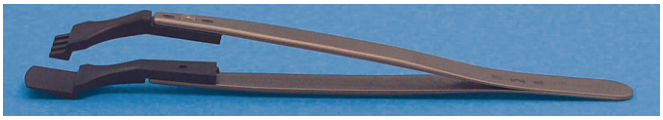
A: 12.0mm (0.47"); B: 9.0mm (0.33"); D: 4.0mm (0.15"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78414-4WF** | EMS 4WF | each |


### Style 4WFCPR

Tips are made of PEEK/CF30 - These tips offer gently holding wafers. Replacement tips are available. A: 0.46" (12mm); B: 0.41" (2.0mm); C: 0.08" (2.0mm); D: 0.14" (3.5mm); E: 0.18" (4.5mm)

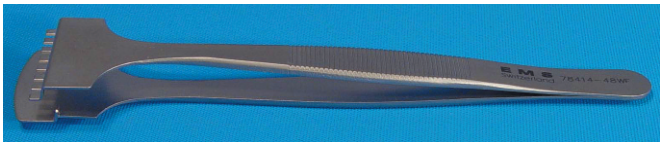
| | | |
|---|---|---|
| **78414-4WFC** | EMS 4WFCPR | each |
| **78414-4WFR** | Replacement Tips set | set |



### Style 48 WF

A: 28.0mm (1.1"); B: 9.0mm (0.35"); D: 4.0m (0.15"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78414-48WF** | EMS 48WF | each |



### Style 8WF

A: 28.5mm (1.12"); B: 12.0mm (0.47"); C: 2.2mm (0.08"); D: 3.5mm (0.14"); E: 2.5mm (0.10")

| | | |
|---|---|---|
| **78420-8WF** | EMS 8WF | each |


### Style 8WNY

A: 65.0mm (2.55"); B: 19.0mm (0.75"); C: 1.3mm (0.05"); D: 2.0mm (0.08")

| | | |
|---|---|---|
| **78422-8WNY** | EMS 8WNY | each |


### Style 600M - Bent

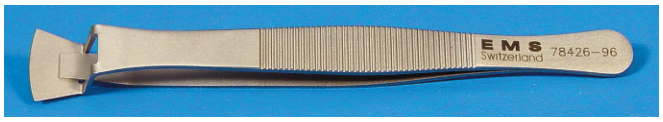
A: 20.0mm (0.79"); B: 11.0mm (0.43"); E: 2.3mm (0.09")

| | | |
|---|---|---|
| **78425-600M** | EMS 600M | each |


### Style 96 – Self-Closing

A: 14.5mm (0.57"); B: 10.5mm (0.41"); C: 9.0mm (0.35")

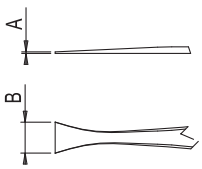
| | | |
|---|---|---|
| **78426-96** | EMS 96 | each |




## Dumont Wafer Handling Tweezers

### Style 35A

Wafer handling tweezers,
Length: 120mm





| Cat. # | A mm | B mm | Finish | Alloy | Unit |
|---|---|---|---|---|---|
| **0403-35A-PS** | 0.15 | 7 | Matte | Dumoxel® | each |

### 36A/30

Wafer handling tweezer,
bent 30 degrees.

Length: 118mm

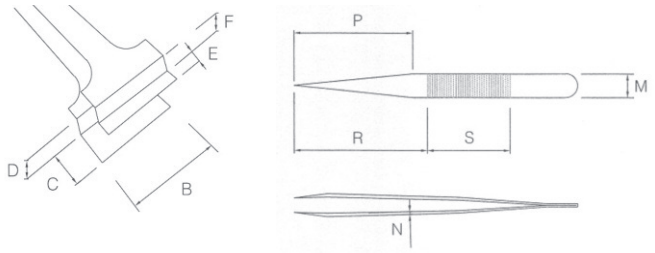
| Cat. # | A mm | B mm | Finish | Alloy | Unit |
|---|---|---|---|---|---|
| **0403-36A/30-PS** | 0.2 | 6 | Matte | Dumoxel® | each |

# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## Wafer Handling Tweezers (continued)

### Rubis Wafer Tweezers

Made from SA steel with serrated handles. These tweezers are specially designed to handle different fragile and delicate materials of gallium or silicon wafers. They have a smooth polished non-glare surface with a satin finish. The tweezers have stopping pins turned up on lateral edges and graduated lower paddles prevent the wafer from slipping. The tweezers are also available in Peek material. Peek: An ESD Safe, $10^5\Omega$ x cm. Soft, conductive fiber, with heat resistance up to 250°C (short exposure 300°C). (Not compatible with nitric and sulfuric acids.)




#### Style 2LB/4

No teeth. Length: 128mm (5"). B =12.5mm (½"), C = 8mm (⅓"), D = 3mm (⅛"), E = 2mm (1/12"), F = 4mm (⅛"), M = 9mm (⅓"), N = 2mm (1/12"), R = 48mm (1¾"), S = 42mm (1⅔")


| | | |
|---|---|---|
| **78220-01** | Wafer Tweezers, Style 2LB/4 | each |

#### Style 39S-4

4 teeth, lower part perforated. Length: 128mm (5"). B =12.5mm (½"), C = 10mm (⅓"), E = 2mm (1/12"), F = 6mm (¼"), M = 9mm (⅓"), N = 1.5mm (1/16"), R = 48mm (1¾"), S = 4mm (1⅔")


| | | |
|---|---|---|
| **78225-01** | Wafer Tweezers, Style 39s | each |

#### Style 41LB-2

2 teeth. Flat lower paddle. Length: 128mm (5"). B = 6mm (¼"), C = 7.0mm (¼"), E = 2mm (1/12"), F = 3mm (⅛"), M = 9mm (⅓"), N = 1.5mm (1/16"), R = 52mm (2"), S = 42mm (1⅔")


| | | |
|---|---|---|
| **78226-01** | Wafer Tweezers, Style 4 | each |

#### Style 41LB-5

5 teeth. Flat lower paddle. Length: 132mm (5¼"), B =16mm (⅝"), C = 9mm (⅓"), E = 2mm (1/12"), F = 3mm (⅛"), M = 11mm (½"), N = 2mm (1/12"), R = 52mm (2"), S = 42mm (1⅔")


| | | |
|---|---|---|
| **78229-01** | Wafer Tweezers, Style 41LB-5 | each |

#### Style 42LB6

6 teeth. Step up lower paddle. Length: 130mm (5⅛"), B = 19.5mm (¾"), C = 8mm (½"), D = 3mm (⅛"), E = 3mm (⅛"), F = 4mm (⅛"), M = 11mm (½"), N = 2mm (1/12"), R = 52mm (2"), S = 42mm (1⅔")


| | | |
|---|---|---|
| **78237-01** | Wafer Tweezers, Style 42LB 6 | each |

#### Style 43LB-8-Peek

Clean-room compatible. Length: 138mm (5½"). B = 27mm (1⅛"), C = 21mm (¾"), D = 4mm (⅛"), E = 6mm (¼"), F = 5mm (⅕"), M = 11mm (½"), N = 1.5mm (1/16"), R = 61mm (2⅓"), S = 35mm (1⅔")


| | | |
|---|---|---|
| **78239-01** | Wafer Tweezers, Style 43LB-8 Peek | each |

#### Style 43LB-4-Peek

Clean-room compatible. Length: 138mm (5½"). B = 13mm (1⅛"), C = 21mm (¾"), D = 4mm (⅛"), E = 6mm (¼"), F = 5mm (⅕"), M = 11mm (½"), N = 1.5mm (1/16"), R = 61mm (2⅓"), S = 35mm (1⅜")


| | | |
|---|---|---|
| **78240-01** | Wafer Tweezers, Style 43LB-4 Peek | each |

#### Style 43LB-10

10 teeth. Flat lower paddle with opening controller. Length: 190mm (7½"). B = 33.5mm (2"), C = 20mm (¾"), D = 7mm (¼"), E = 2mm (1/12"), F = 3mm (⅛"), M = 13mm (½"), N = 2mm (1/12"), R = 77mm (3"), S = 42mm (1⅔")

| | | |
|---|---|---|
| **78241-01** | Wafer Tweezers, Style 43LB-10 | each |



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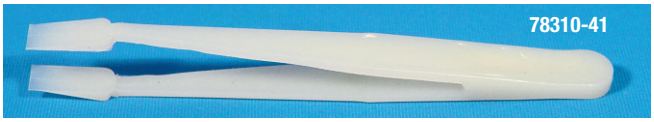
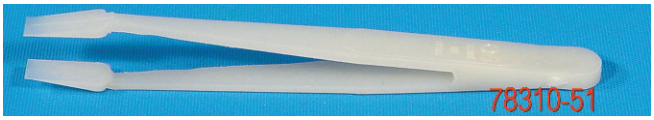
# CLEAVING & SCRIBING SYSTEMS AND TOOLS

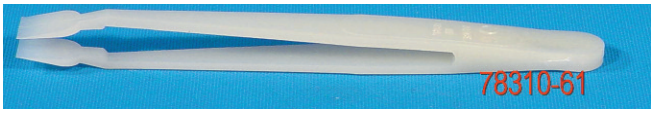
## Wafer Handling Tweezers (continued)

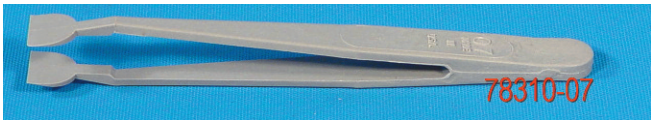
### Plastic Wafer Tweezers and Pliers

Designed for low cost and ease of use with the highest quality of materials.

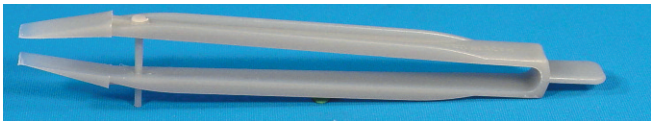







78314-P1

78314-P2

| | | |
|---|---|---|
| **78310-04** | Glass-filled Delrin for delicate, thin, and flat objects, 11.3cm long | each |
| **78310-41** | Same as #78310-04 but made from linear polyethylene, acid resistant | each |
| **78310-05** | Glass filled Delrin, useful for handling coverslips or glass slides 11.3 cm long | each |
| **78310-51** | Same as #73810-05 but made from linear polyethylene, acid resistant | each |
| **78310-06** | Glass-filled Delrin, good for glass slide, wafer handling, 11.3cm long | each |
| **78310-61** | Same as #73810-06 but made from linear polyethylene, Acid resistant | each |
| **78310-07** | Glass-filled Delrin with extra wide point, 11.3cm long | each |
| **78310-71** | Same as #78310-07 but made from linear polyethylene, Acid resistant | each |
| **78311-4A** | Fluorocarbon, acid resistant,extra long with line up pin, 16.5cm | each |
| **78311-5A2** | Linear polyethylene, acid resistant, 16.5cm long | each |
| **78314-P1** | Glass-filled Delrin pliers. Serrated jaws, hold tubes securely, resistant to most solvents | each |
| **78314-P2** | Glass-filled Nylon pliers, flat smooth jaws. Good for handling soft materials. Protected from damage.15 cm long | each |

### Plastic Tweezers

*Resist virtually any commercial solvents i.e. Nitric, Aqua-Regia, Acetic acid, Acetone, Alcohol, etc.*

- Acid Resistant
- Non-Magnetic
- Gentle Positive Grip
- Non-Absorbent

Tips will not open when extra pressure is applied

| Cat. No. | Description/Purpose | Qty. |
|---|---|---|
| **78560-01** | Semiconductors, Chips, Wafers | |
| |  | |
| | **Measurements:** 4-9/16" x 7/16" body tapering down to .008" thick by 1/8" wide at Tweezer Tips. | each |
| **78560-02** | Made of Celcon static dissipative (ESD safe) Max. temp. 175°F. | |
| |  | |
| | **Measurements:** 4-9/16" x 7/16" body tapering down to .008" thick by 1/8" wide at Tweezer Tips. | each |
| **78560-05** | Angled tweezers, ideal for delicate wafers | |
| |  | |
| | **Measurements:** 4-15/16" x 7/16" body tapering down to .004" by 3/16" wide at Tweezer Tips. | each |
| **78560-09** | For larger diameter wafers, etc. | |
| |  | |
| | **Measurements:** 4-5/8" x 7/16" at body .007" thick by 9/32" wide at tips. | each |
| **78560-13** | Made of Celcon static dissipative (ESD safe). Max. temp is 175°F. | |
| |  | |
| | **Measurements:** 4-9/16" x 7/16" at body tapering down to a sharp point at Tweezer tips. | each |
| **78560-15** | Wide Tips, Glass-filled Delrin | |
| |  | |
| | **Measurements:** 9mm, 11.3cm long | each |
| **78560-16** | Glass-filled Delrin | |
| |  | |
| | **Measurements:** 11.3mm, 11.3cm long | each |
| **78560-17** | Special 1cm wide flat points | |
| |  | |
| | **Measurements:** 16-1/2cm long | each |

# CLEAVING & SCRIBING SYSTEMS AND TOOLS

## Omni Grids

### Copper Lift-Out Grids


Custom copper lift-out grids specifically designed for in-situ lift-out. These grids include multiple indexed mounting locations with both vertical bars and "V" shaped attachment surfaces. 3mm diameter.

| | | |
|---|---|---|
| **75964-01** | Copper Lift-Out Grids | 100/vial |

### Molybdenum Lift-Out Grids


Custom molybdenum lift-out grids specifically designed for in-situ lift-out. These grids include multiple indexed mounting locations with both vertical bars and "V" shaped attachment surfaces. 3mm diameter.

| | | |
|---|---|---|
| **75964-02** | Molybdenum Lift-Out Grids | 25/vial |

### Beryllium Haft-Ring Grids

Custom beryllium haft ring grids. 3mm diameter.

| | | |
|---|---|---|
| **75964-03** | Beryllium Haft Ring Grids | 10/pk |

### Copper 5-Post Lift-Out Grids


Custom copper 5-post lift-out grids specially designed for in-situ lift-out. These grids include multiple indexed mounting locations, all with vertical bars attachment surfaces. Now with lower profile sides for easier access to utermost posts. 3mm diameter.

| | | |
|---|---|---|
| **75964-04** | Copper 5-Post Lift-Out Grids | 100/vial |

### Copper 4-Post Lift-Out Grids


Custom copper 4-post lift-out grids specially designed for in-situ lift-out. These grids include multiple indexed mounting locations, two with vertical bars attachment surfaces and two with "V" shaped alignment surfaces. Sides have lower profile for easier access to outermost posts. 3mm diameter.

| | | |
|---|---|---|
| **75964-05** | Copper 4-Post Lift-Out Grids | 100/vial |

### Molybdenum 4-Post Lift-Out Grids


Custom Molybdenum 4-post lift-out grids specially designed for in-situ lift-out. These grids include multiple indexed mounting locations, two with vertical bars attachment surfaces and two with "V" shaped alignment surfaces. Sides have lower profile for easier access to outermost posts. 3mm diameter.

| | | |
|---|---|---|
| **75964-06** | Mo 4-Post Lift-Out Grids | 25/vial |

### Copper 3-Post Lift-Out Grids, Side Access


3 post copper lift-out grids, similar to 75964-01, in design but 35 micron thick with 1 edge lower for easy access. Packaged in glass vials

| | | |
|---|---|---|
| **75964-07** | Copper 3-Post Lift-Out Grids, Side Access | 100/vial |

### Copper 3-Post Lift-Out Grids, Shallow Downset


3 post copper lift-out grids specifically designed for in-situ lift-out. These grids include multiple indexed mounting locations with both vertical bar and "V" shaped attachment surfaces. These grids have a shallower downset and slightly wider center post than 75964-01. Packaged in glass vials.

| | | |
|---|---|---|
| **75964-08** | Copper 3-Post Lift-Out Grids, Shallow Downset | 100/box |

### Copper 5-Post Lift-Out Grids


5 post copper lift-out grids specifically designed for in-situ lift-out. These grids include multiple indexed mounting locations, all with vertical bar attachment surfaces. Now with lower profile sides for easier access to outermost posts. 3mm dia. Packaged in glass vials.

| | | |
|---|---|---|
| **75964-09** | Copper 5-Post Lift-Out Grids | 100/box |

### Copper 4-Post Lift-Out Grids

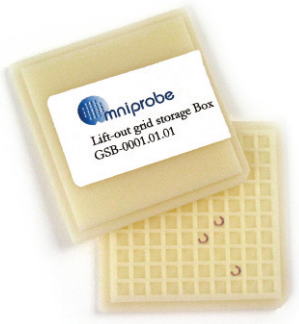

4 post copper lift-out grids specifically designed for in-situ lift-out. These grids include multiple indexed mounting locations, two with vertical bar attachment surfaces and two with "V" shaped alighment surfaces. Sides have lower profile for easier access to outermost posts. 3mm dia. Packaged in plastic vials.

| | | |
|---|---|---|
| **75964-10** | Copper 4-Post Lift-Out Grids | 100/box |

### Omni Grid Storage Box

Storage box for 100 standard or haft grids—3 mm diameter – TEM grids. Box comes complete with base, lid and clips.

| | | |
|---|---|---|
| **75965-01** | Grid Storage Box | each |




## Omniprobe TEM Grid Comparison Chart

| Part Number | Number of Posts | Material | Thickness (Nominal) Microns | Nominal Post Downset Microns | Unique Feature |
|---|---|---|---|---|---|
| **75964-01** | 3 | Copper | 30 | 10 | — |
| **75964-02** | 3 | Molybdenum | 30 | 10 Top Downset only | |
| **75964-03** | 0 | Beryllium | 25 | N/A | Half Ring |
| **75964-04** | 5 | Copper | 40 | 10 | 5th Post is E |
| **75964-05** | 4 | Copper | 30 | 10 | — |
| **75964-06** | 4 | Molybdenum | 30 | 10 Top DS Only | |
| **75964-07** | 3 | Copper | 30 | 5 | Side Access |
| **75964-08** | 3 | Copper | 30 | 5 | — |
| **75964-09** | 5 | Copper | 35 | 5 | 5th Post is "E" |
| **75964-10** | 4 | Copper | 30 | 5 | — |



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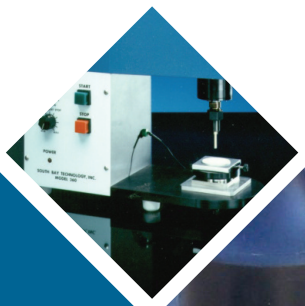
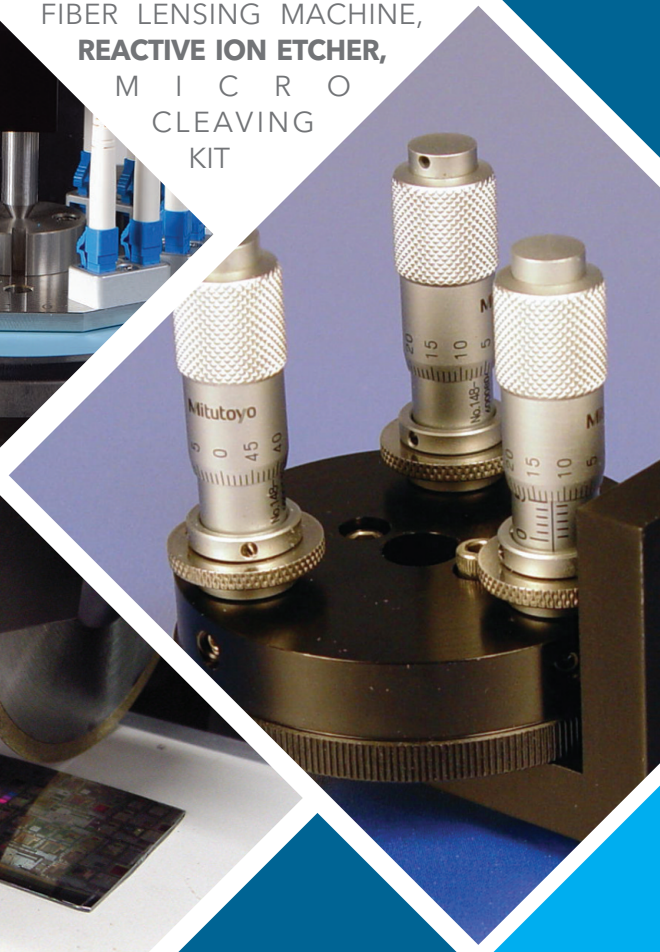
# INSTRUMENTATION

**MICRO-MANIPULATORS,** MICRO DRILLING SYSTEMS, **SPARK CUTTER AND ACCESSORIES,** ROTARY DISC AND ULTRASONIC CUTTERS, **DIAMOND WHEEL SAWS,** WIRE SAWS, **DIMPLERS,** TRIPOD POLISHERS, **LAPPING AND POLISHING MACHINES AND FIXTURES,** FIBER LENSING MACHINE, **REACTIVE ION ETCHER,** MICRO CLEAVING KIT




Electron Microscopy Sciences

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# INSTRUMENTATION

Electron Microscopy Sciences offers a full range of equipment used in materials preparation for a variety of technological fields:

- Electron Microscopy
- Metallography
- Wafer Lapping and Polishing
- Failure Analysis
- Crystal orientation
- Plasma Processing
- MEMS

...and many other applications. Please contact us or see our comprehensive website, which includes our complete line.

## NEW PRODUCTS...


### Model 200 Dimpling Grinder

An easy-to-use, state-of-the-art, mechanical thinning instrument designed for the reproducible preparation of high-quality electron microscopy specimens.

**See pages 143–144.**


### Model 160 Specimen Grinder

Mechanically prethins specimens for transmission electron microscopy (TEM). Greatly reduces the time spent during the final preparation process of ion beam milling.

**See page 144.**

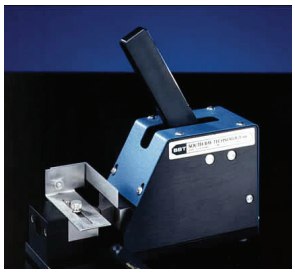
## The Quick Jig

*A Universal Mounting Fixture*

The Universal Sample Mounting Fixture is a versatile spring-loaded fixture for securing samples with pressure during mounting using adhesives, waxes, and epoxies. The fixture can be used at room temperature or on a hot plate for heat curable epoxies or faster drying of conductive paint. A scale on the pressure rod allows the user to apply reproducible pressure, from very light to heavy. Two interchangeable trays accommodate six different sized disk sample mounts (1/2",3/4",1",1-1/4", 1-1/2", and 2" diameters) and five angled SEM pin stubs (0°, 45°, 52°, 70°, and 90°). The angled SEM pin stubs are held with screws on the angled surface so that the sample lies horizontally and the pressure applied vertically normal to the sample's surface. The 70° angle is useful for pre-tilted EBSD sample holders and the 52° angle is useful for FIB holders. The PTFE tip contacting the sample is compliant and easily cleaned if any adhesive inadvertently comes in contact with it. The fixture adapts to a large range in sample height.

| Cat. No. | Description | Qty. |
|---|---|---|
| **50160-05** | Universal Mounting Jig | each |

## Disc Punch



The EMS 310 Disc Punch is designed to prepare ductile metals and soft materials for TEM without mechanical distortion. Its solid construction and high tolerance design allows a maximum force to be used with difficult materials while maintaining specimen quality. A specimen alignment tool is included which guarantees maximum specimen yield and precise specimen location. After the disc is punched it is automatically selected from the die and collected in an easily removable tray.

### FEATURES:

- **Preparation of TEM samples without distortion**
- **Alignment fixture included for maximum yield and precise specimen location**
- **Solid construction for long term use without loss of precision**
- **Dimensions: 8"(W) x 8"(H) x 2.5"(D); Weight: 5 lb. Disc size: 3.0mm**

| Cat. No. | Description | Qty. |
|---|---|---|
| **50125-10** | Disc Punch Set | set |
| **Replacement parts and products that are available for Disc Punch:** | | |
| **50125-50** | Specimen Holder Base | each |
| **50125-51** | Specimen Holder | each |
| **50125-52** | Knurled Screw (to hold specimen holder to base) | each |
| **50125-54** | Specimen Tray | each |

## Disc (Tab) Punch

Produces discs (tabs) from sheet materials. Ticket punching type. Comes with adjustable side gauge for centering hole, 2" maximum reach. Weight 10 oz., 6½" long. Useful for punching adhesive tabs for specimen mounts, or producing circle cover slips from ACLAR® films (EMS #50425 or #50426) for growing cells. Maximum thickness for punching is up to 67-mil (1.7 mm). Disc size available: 5⁄16", 3⁄8", ½" and 1". Complete unit includes one punch handle and one punching die.

| Cat. # | Description | Qty |
|---|---|---|
| **77850-08** | Punch, 5⁄16" (7.94 mm) Circle | each |
| **77850-09** | Punch, 3⁄8" (9.54 mm) Circle | each |
| **77850-12** | Punch, ½" (12.7 mm) Circle | each |



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## Micro-Mill® Grinder


For fast, high-speed grinding of small samples from 20 to 50mm (¾" to 2"). The unit comes with a stainless steel or hard-faced blade which rotates at speeds up to 12,000 rpm and will successfully grind bauxite, bone, ceramics, coal, Devorda's alloy, fertilizer, filter paper, fly ash, frozen tissue, glass, grain, kaolinites, leaves, limestone, muscle tissue, pharmaceuticals, pigment blends, plastics, rocks, roots, seeds, slags, soil, teeth, wood, etc. The grinding chamber measures 2⅛"dia.x1"deep (54x25mm). Its overall dimensions are 5½"x7"x11"(H) (14x18x28cm). It comes with a 6 ft. (1.8m) 3-wire cord and grounded plug. Power: 115V, 60Hz or 220V, 60Hz.

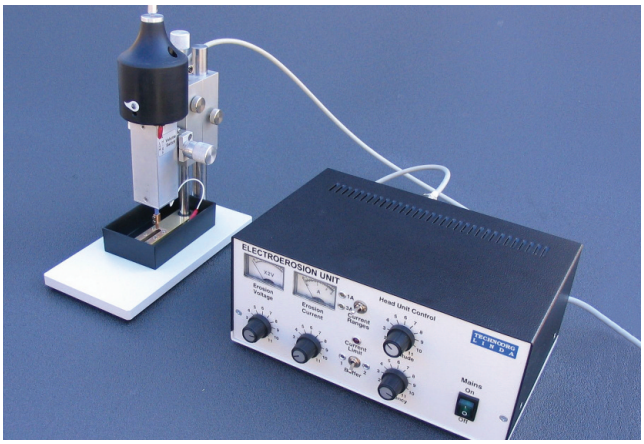
### FEATURES:

- **The grinder operates only when the cover is latched and in place. This provides safety and prevents sample loss.**
- **The temperature of the grinding chamber can be maintained by means of built-in heat exchangers. ¼" (6.4mm) tubing connections on the cover and housing accept tubes for circulating water, methanol/dry ice liquid, or liquid nitrogen.**
- **The cover, grinding assembly, and milling blade head are removable for easy cleaning.**
- **The aluminum housing has an epoxy finish and non-skid rubber feet.**
- **The control panel has an overload protection reset button and a pilot light.**
- **The 1/5 horsepower (150 watts) motor develops a torque of 30-ounce-inches (2.2 Kg-cm) at 12,000 rpm.**

### ORDERING INFORMATION

Micro-Mill® 1, with stainless steel blade, 0-5 minutes electrical timer with an ON position for continuous operation.
Micro-Mill® 2, with hard, stellate faced blade, with a momentary hold-down switch.

| Cat. No. | Description | Qty. |
|---|---|---|
| **50100-01** | Micro-Mill® Grinder 1, 115 V | each |
| **50100-02** | Micro-Mill® Grinder 1, 220 V | each |
| **50101-01** | Micro-Mill® Grinder 2, 115 V | each |
| **50101-02** | Micro-Mill® Grinder 2, 220 V | each |
| **50104-01** | Replacement Stainless Steel Blade | each |
| **50104-04** | Replacement Stellate-Faced Blade | each |




## Spark Cutter, Model EE4 (Electroerosion)

The EE 4 Spark Cutter (Electroerosion Unit) is designed for drilling holes, slots and discs of virtually any profile in hard meals. The cutting speed will, of course, vary depending on the sample size and material. As an example, a hole can be drilled in titanium sheet of 0.3 mm thick in about 20 – 60 minutes depending on the surface quality required.

### Application

Because of the basic operating principle of the Spark Cutter, it is advised that the device can onlybe used for high-conductivity materials (with the exception of aluminum). The work piece holder accessory can hold 5 mm wide metal bands. Work piece of different size require modification of the holder.

### Operation

Operation of the device is based on an electrochemical process. The drilling tool and work-piece are connected to the power supply: the positive pole to the work-piece, and the drill through an electromagnetic coil to the negative pole. By switching on the power supply, electric current flows through the circuit consisting of the work-piece, the electromagnetic coil and the drill. When the electric current exceeds a certain limit, the magnetic field of the coil lifts up the drill and the current is cut off. The drill is then forced back to the work-piece by a spring in the head unit, and the cycle starts again. The drilling is effected by the electrochemical process taking place at the moment that the electric circuit is stopped.

### SPECIFICATIONS

| | |
|---|---|
| **Power Supply Unit** | |
| **Power Input** | 100 – 120 VAC, 50/60 Hz 1 A, or<br>220 – 240 VAC, 50/60 Hz, 0.5A |
| **Power Output** | approx. 1.5 – 20 VDC, 2 A (average) |
| **Dimensions** | 100 x 170 x 235 mm |
| **Head Unit** | |
| **Power Input** | approx. 1.5 – 20 VDC, 2 A(average) |
| **Dimensions** | 140 x 260 x 290 mm |

### System Configuration

Power Supply Unit
Head Unit including drilling tool in diameter of 3 mm

### Option

Drill tool of 1 mm in diameter.

| Cat. No. | Description | Qty. |
|---|---|---|
| **55110-EE4** | Spark Cutter, Model EE 4 | each |
| **55110-H4** | Drill Tool for 1mm Dia | each |

# INSTRUMENTATION

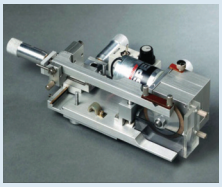
## XTEM TEM Sample Preparation Kit

EMS offers this kit specifically for the preparation of cross-sectional TEM (XTEM) specimens.

For the study of interfaces (such as semiconductor devices, thin film layers, etc.) by transmission electron microscope (TEM) it is critical to use TEM samples of ultimate quality (perfectly embedded, mechanically pretreated and ion milled ones). EMS offers a complete technology and product range for preparing cross-sectional samples of these quality including specially designed mechanical sample preparation tools and embedding ring. The EMS-XTEMprep Preparation Kit offers all the tools and materials that help to prepare high-quality cross-sectional TEM specimens:

### THE KIT INCLUDES:

- Microsaw sectioning tool
- Micropol grinder and polisher
- Microheat embedding tool
- Embedding rings ("Ti disc") – 5 of each size
- Ion beam resistant glue
- Special purpose mechanical tools (HSS) for embedding
- LEIT-C conductive carbon cement
- Thermoplastic transparent glue
- Diamond paste




### ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **50110-XTEM** | XTEM Preparation Kit | kit |
| Each Item May be ordered separately as well: | | |
| **55150-MS3** | MicroSaw MS3 | each |
| **55110-MH2** | MicroHeat MH4 | each |
| **50174-MC2** | MicroPol MC3 | each |
| **55110-TIR** | TI Embedding Rings | 5/pk |
| **55110-HSS** | Mechanical Tool Kit | kit |
| **55110-AT1** | Ion Beam Resistant Glue | each |
| **12667** | Leit C Plast Adhesive | each |
| **55110-MW** | Transparent Glut | each |
| **50370-40** | Diamond Paste 1 Micron | each |

## MicroSaw – Model MS 3

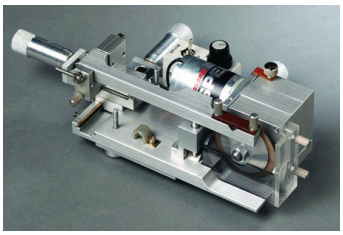
*A Circular Diamond Saw for Precision Cutting under Stereo Microscope*

### Application

MicroSaw is a small, versatile diamond wheel saw, to be mounted under a standard laboratory microscope. The precision offered by such an optical alignment makes MicroSaw ideal for cutting and sectioning required during the TEM specimen preparation. The compact design and easy operation, MicroSaw allows the user cut almost any solid material with precisely and reproducibly prior to thinning for TEM. Thin ceramic, semiconductor material, hard metals can be further sectioned with 0.01mm accuracy!

### Operation

The Model MS3 MicroSaw is driven by an electric motor through a helical transmission. The 12V DC is provided by the power supply subunit. The speed at which the wheel turns is continuously adjustable. Adjustment of the specimen position, arm contact point, arm tension and the down-stop control mechanism is possible. Two adjustment screws at the bottom of the instrument allow positioning of the stand, and leveling the MicroSaw underneath of the stereomicroscopy for precision sectioning.



### SPECIFICATIONS

| | |
|---|---|
| **Input Power** | 12 VDC |
| **Power Consumption** | 15W |
| **Dimensions** | 260mm x 150 x 80 mm |
| **Diamond wheel** | size: 50mm diameter, 0.15mm thick<br>type: AC32 63/50 |
| **Maximum Sample Size** | ~ 10 x 10 mm |
| **Minimum slice thickness** | ~ 100 microns |

**System Configuration**

- Switching power supply 100 – 240 VAC, 50/60 Hz
- MicroSaw Model MS3 with 1 diamond wheel (#55150-10)

| Cat. No. | Description | Qty. |
|---|---|---|
| **55150-MS3** | MicroSaw, Model MS 3 | each |
| **55150-10** | Replacement diamond wheel | each |

## MicroHeat, Model MH 4

*Thermoplastic gluing under stereo microscope*

### Application

Microheat is a heat stabilized small hot plate combined with power supply designed for embedding samples and for thermoplastic gluing under stereooptical microscope. The Microheat was developed to make the embedding procedure easier. Due to its small dimensions it can be easily placed on the specimen table of the stereooptical microscope and this way gluing faults can be avoided. This result is especially important in case of samples requiring bubble-free sticking (e.g. cross-sectional samples for electron microscopy).

### Operation

The Model MH4 is relatively simple to operate. The temperature of the hot plate can be adjusted continuously in a wide range and is kept constant by the built-in electronic. A control circuit maintains the temperature of the heated surface within +5 degrees Celsius. The actual temperature is displayed on the top of the tool. The temperature of the heated surface usually reaches the preset temperature within 1-3 minutes.


### SPECIFICATIONS

| | |
|---|---|
| **Power Input** | 12V DC, 1.2 A |
| **Power Consumption** | 14 W |
| **Temperature Range** (continuously adjustable) | 50-150°C |
| **Dimensions** | 100 x 100 x 30 mm |

### System Configuration

Switching power supply 100 – 240 VAC, 50/60 Hz
MicroHeat unit.

| Cat. No. | Description | Qty. |
|---|---|---|
| **55110-MH2** | MicroHeat, Model MH 4 | each |



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## Micropol™ Polisher For TEM & Metallography – Model MC3


Micropol™ polisher is a compact, versatile, electrically controlled, precise mechanical specimen grinder/polisher designed for planar grinding, dimpling, thinning and polishing of specimens in the fields of nanotechnology, semiconductors and material science. The parameters of polishing (speed, load, time, etc.) can be matched according to the properties of the specimen. High quality samples are prepared with minimal efforts by the operator.

### FEATURES

- **Rugged, corrosion proof construction**
- **MicroPol Parts Variable speed control for precision polishing**
- **Quick change bayonet mount bowls**
- **Timer for automatic operation**
- **Extremely light load for fragile TEM samples**

### Application

While the Micropol™ MC3 is well suited for metallographic polishing, it has been specially designed for precision TEM polishing applications. Two types of specimen holders are provided with each unit that makes it ideal for the preparation of both planar and dimpled samples, respectively.

### Operation

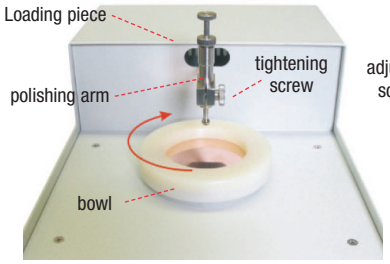
The arm of Micropol™ moves the specimen holder or the specimen itself in a semi-random geometric pattern gently pressing it to the bottom of a bowl containing suitable abrasive material. The abrasive material can be grinding paper or suspensions of polishing compound deposited on polishing cloth.

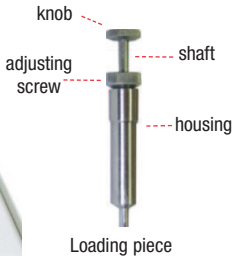
### System Configuration

- Main Unit
- Accessories shipped with the equipment
  - *-Flat plastic polishing bowls (4 pieces)*
  - *-Spherical bowls for dimpling: Cu, Al, Plastic lining, Empty bowl (1 piece each)*
  - *-Specimen holder for flat bowl (1 piece)*
  - *-Specimen holder for spherical bowl (1 piece)*
  - *-Thickness Measuring Kit*
  - *-Starting Kit of Consumables (abrasive papers, polishing cloth, samples of abrasive diamond pastes and thermoplastic wax)*

### SPECIFICATIONS

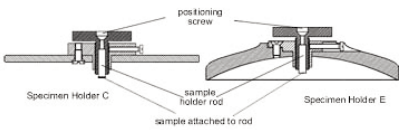
| | |
|---|---|
| **Power Supply** | 100-240 V AC, 50-60 Hz |
| **Power Consumption** | max. 85 W |
| **Moving Speed of the Arm** | 30-60 scans/min, electronically adjustable |
| **Load** | 0-5 N, mechanically adjustable |
| **Timing** | 1-3600 sec, electronically adjustable |
| **Maximum sample size** | about 10-15 mm dia. |
| **Moved mass** | max. 150 g |
| **Dimensions** | 251 x 220 x 181mm |




*Specimen holder "C"*

*Specimen holder "E"*




*Section showing the sample holder rod and the correct position of the sample*

*scale for polishing thickness control*

*Thickness Measuring Kit*

### ORDERING INFORMATION

Includes a Starter Kit of all the consumables necessary for operation of MicroPol™ Polisher:

- Abrasive papers small discs cut in the size of the polishing bowls (in 320 and 800 grit sizes) – 2 pcs each,
- Polishing cloth (PELLON type) small disc cut in the size of the polishing bowls – 2 pcs,
- Samples of abrasive diamond pastes in grain sizes of 1 and 10m for polishing – 1 sample each.
- Sample piece of thermoplastic wax

| Cat. No. | Description | Qty. |
|---|---|---|
| **50174-MC2** | MicroPol™ Polisher, MC3 | each |

## Ti Disc Embedding Ring for TEM Sample Preparation

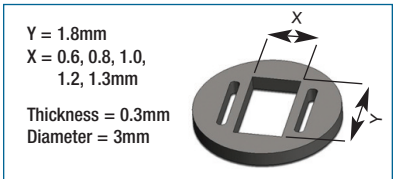



**Figure 1.**

The most difficult step of cross-sectional thinning is the mechanical preparation of the sample, i.e. cutting a cross section and then embedding it into an appropriately designed ring.

We now offer a convenient, specially designed embedding ring for cross-sectional samples, shown schematically in Figure 1.

Using this ring, embedding cross sections is greatly simplified, since the samples do not need to be glued together prior to embedding. In order to fix the sample(s) in the ring it is deformed mechanically by an appropriate tool at the two points marked by the arrows. This deformation will both hold the sample in the ring and press both sample pieces together before gluing.

Ti disc is also offered for embedding bulk samples of brittle material for plan-view TEM investigations. The rings come in 5 sizes-0.6, 0.8 1.0, 1.2, 1.3 mm.

| Cat. No. | Description | Qty. |
|---|---|---|
| **55110-TIR** | Ti Disc Embedding Rings | 5/pk |

## HSS Tool Kit

The mechanical sample preparation prior to thinning requires custom made mechanical hand tools. Containing six handy, reliable pieces, this kit has been designed on the basis of practical experience of many users. Some of the tools are suitable for adjusting the sample pieces into the Ti discs, others for removing the excess glue and cutting, or adjusting the seat plate of the sample holder.

| Cat. No. | Description | Qty. |
|---|---|---|
| **55110-HSS** | Tool Kit | each |

# UltraSonic Cutter – Model 380

The UltraCut™ 380 Ultrasonic Cutter is a specialized cutting instrument which utilizes abrasive powders and high speed, vibratory motion to cut discs, holes, cylinder, squares and others shapes from hard, brittle materials.

The high speed motion is developed using an ultrasonic transducer oscillating at 26kH. Boron carbide slurry is applied to the sample and the tool is lowered onto the specimen. The particles under the vibrating tool impact the sample and erode the material in the shape of the tool.

## FEATURES:

- **Titanium horn and SoniLoc™ circuitry maximize performance and ensure long term reliability.**
- **Automatic termination simplifies operation and minimizes operator supervision.**
- **Separate power and transducer controls allow specimen illumination lamp to be used without activating the transducer.**
- **A dial indicator with 10 micron graduations continually displays depth of cut.**

### Transducer

Through careful design techniques, the entire transducer has some unique properties which enable the electronic circuitry to recognize the frequency at which mechanical resonance occurs. In the SoniCut™ 380 transducer, the electric voltage and electric current are "in phase" at only a single frequency - the mechanical resonant frequency. In operation, the frequency starts out at a low frequency. The SoniLoc™ circuitry scans the spectrum from the low frequency to higher frequencies until it finds the one frequency which yields" in phase" signals. By design, that frequency is the mechanical resonant frequency and the transducer operates at maximum mechanical amplitude. By using a carefully designed transducer and the SoniLoc™ circuitry, a transducer of extremely high efficiency has been produced.

### Model 36001 Alignment Microscope

If very precise alignment is required, it is recommended to use the Model 36001 Alignment Microscope.

## SPECIFICATIONS

| | |
|---|---|
| **Dimensions** | 6"W x 19"H x 9"D |
| **Net Weight** | 20 lbs. |
| **Transducer Material** | Titanium |
| **Transducer Oscillation** | 26 kH |
| **Tool Material** | Stainless Steel |
| **Frequency Control** | SoniLoc™ phase lock loop circuitry |
| **Termination Method** | Electronic auto stop or manual termination |
| **Cutting Depth Control** | Analog dial gauge with 10 micron graduations |
| **Specimen Location Adjustment** | Unlimited with magnetic base plate movement |
| **Front Panel Controls** | Separate controls for power/illumination and transducer activation |
| **Electrical Input** | 100 VAC 50/60Hz<br>110 VAC 50/60Hz<br>220 VAC 50/60Hz |

## ORDERING INFORMATION

| Cat. No. | Description | Qty |
|---|---|---|
| **55180-380** | UltraSonic Cutter – Model 380 | each |
| **Parts that are included with the Model 380** | | |
| **55172-01** | Alignment Microscope, Model 36001 | each |
| **55180-12** | Metric Tool Kit (9 sizes: 2 – 10mm) | each |
| **55180-1** | Specimen Mounting Plate | each |
| **55180-2** | Magnetic Plate Assembly | each |
| **55180-3** | Magnetic Slurry Ring | each |
| **55180-4** | ⅜" Open End Box Wrench | each |
| **55180-5** | Spare Lamp | each |
| **55180-6** | 0.5A SB Fuse (spare) for 220 volt | each |
| **55180-7** | 1A SB Fuse (spare) for 115 volt | each |
| **55180-8** | Copper Flat Washer (10 spares) | each |
| **55180-9** | Syringe | each |
| **55180-10** | 23µm Boron Carbide Powder, 25g | each |
| **55180-11** | 14µm Boron Carbide Powder, 25g | each |
| **Accessories (option)** | | |
| **55182-01** | Cross Sectioning Kit - Includes all accessories needed for creating XTEM stacks for dimpling and ion milling | each |

| Cat. No. | Description | Qty |
|---|---|---|
| **Consumables** | | |
| **55183-1** | 2.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-2** | 2.3mm ID Cutting Tool, Stainless Steel | each |
| **55183-3** | 3.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-4** | 4.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-5** | 5.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-6** | 6.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-8** | 8.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-9** | 9.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-10** | 10.0mm ID Cutting Tool, Stainless Steel | each |
| **55183-?** | Special Size up to 20mm ID Cutting Tool | each |
| **55183-50** | 2mm x 3mm Cutting Tool Stainless Steel | each |
| **55183-51** | 4mm x 5mm Cutting Tool Stainless Steel | each |
| **55183-XX** | Special size up to 10x10mm Square Cutting Tool, Stainless Steel | each |
| **55183-55** | Specimen Mount | each |
| **55183-56** | Magnet Mounting Plate Assembly | each |
| **55183-57** | Lamp | each |
| **55183-58** | 0.5A SB Fuse (220 volt unit) | each |
| **55183-59** | 1A SB Fuse (115 volt unit) | each |
| **55183-61C** | Copper Flat Washer for use between tool/horn | each |
| **55183-61** | Syringe | each |



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## Rotary Disc Cutter – Model 360

Model 360 Rotary Disc Cutter is a precision instrument, which is designed to precisely align and cut discs or drill holes from a wide range of materials using either a tube shaped brass tool with an abrasive slurry or a diamond tipped tool. The Model 360's rotating tool is continually lowered into the specimen using an easily adjustable counterbalancing weight. The most common application for the instrument is to cut 2.3mm and 3.0mm discs for TEM, although discs as small as 1.25mm and as large as 50mm have been cut.

The model 360 includes everything necessary to operate the unit.

### Model 36001 Alignment Microscope

If very precise alignment is required, it is recommended to use the Model 36001 Alignment Microscope.

## ORDERING INFORMATION

| | | |
|---|---|---|
| **55170-360** | Rotary Disc Cutter – Model 360 | each |

### Parts that are included with the Model 360

| | | |
|---|---|---|
| **55172-94** | Metric Tool Kit (9 sizes: 2.3 – 9mm), #36094 | each |
| **55172-95** | English Tool Kit (6 sizes:⅛-7⁄16"), #36095 | each |
| **55170-1** | Magnetic Base | each |
| **55170-2** | Magnetic Plate | each |
| **55170-3** | Magnetic Slurry Ring | each |
| **55170-4** | Specimen Mounting Plate, magnetic | each |
| **55170-5** | 1" Work Table | each |
| **55170-6** | 2" Work Table | each |
| **55170-7** | Plastic Splash Guard | each |
| **55170-8** | Bottle (x2) | each |
| **55170-9** | Graphite Mounting Plate 0.87" x 0.87" (x4) | each |
| **55170-10** | Graphite Mounting Plate 1.87" x 1.87" (x4) | each |
| **55170-11** | Aluminum Mounting Plate 1.5" x 1.0" (x2) | each |
| **55170-12** | Aluminum Mounting Plate 2.0" x 2.0" (x2) | each |
| **55170-13** | Hex Wrench Set | each |
| **55170-14** | 14µ Silicon Carbide Powder, 50 g | each |
| **55170-15** | 14µ Boron Carbide Powder, 25 g | each |
| **16550-100** | Glycerin, 100ml | each |
| **55170-16** | Wrench, Open End, 0.5" Opening | each |
| **55170-17** | Wrench, Open End, 0.75" Opening | each |

### Accessories

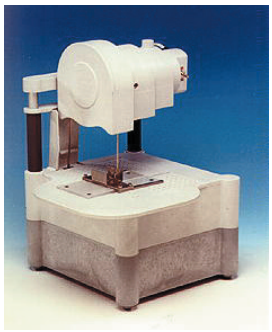
| | |
|---|---|
| **55172-01** | Microscope Alignment Assembly, Model 36001 |

### Consumables

| Metric Tools | | English Tool | | Diamond Tools | | |
|---|---|---|---|---|---|---|
| **Cat. #** | **Metric ID*** | **Cat. #** | **English ID*** | **Cat. #** | **Diamond ID*** | **Pkg.** |
| **55173-03** | 3.0mm | **55174-01** | ⅛" | **55175-02** | 2.3mm | each |
| **55173-04** | 4.0mm | **55174-02** | 3⁄16" | **55175-03** | 3.0mm | each |
| **55173-05** | 5.0mm | **55174-03** | ¼" | *OD is 2mm larger than ID | | each |
| **55173-06** | 6.0mm | **55174-04** | 5⁄16" | | | each |
| **55173-07** | 7.0mm | **55174-05** | ⅜" | | | each |
| **55173-08** | 8.0mm | **55174-06** | 7⁄16" | | | each |
| **55173-09** | 9.0mm | *OD is ¼" larger than ID | | | | each |
| **55173-10** | 10.0mm | | | | | each |
| **55173-15** | 15.0mm | | | | | each |
| **55173-20** | 20.0mm | | | | | each |
| **55173-25** | 25.0mm | | | | | each |
| **55173-30** | 30.0mm | | | | | each |

*OD is 1mm larger than ID

## Diamond Band Saw - Model 865



Constructed from a high impact polymer, the lightweight Model 865 Diamond Band Saw is designed for medium precision, with efficient cutting of hard and brittle materials. However, the saw is rugged enough to cut through materials such as soft metals and polymers as well. Samples can be safely hand fed into the blade with or without the standard specimen guide. The diamond plated steel core blades are designed to last long under normal conditions. Easy blade access and replacement make occasional saw maintenance extremely simple. Coolant is contained in a reservoir at the base of the saw.

## FEATURES:

- **Small, lab bench size.**
- **Quick adjustable blade guide keeps the blade tracking properly.**
- **Rugged, corrosion-proof construction.**
- **Powerful motor cuts fast, won't bog down under load.**
- **Minimum coolant splash for clean cutting.**
- **Easy access coolant tray for fast and easy clean up.**
- **Large table for cutting bulk samples.**
- **Sample guide for straight, flat surfaces.**
- **Economically priced.**

## SPECIFICATIONS

| | |
|---|---|
| **Dimension** | 12" (W) x 14"(D) x 18"(H) |
| **Weight** | 15 lbs |
| **Maximum Sample Dia.** | 3.25" (82.55mm) |
| **Cutting Table Dimensions** | 12"(W) x 13"(D) |
| **Standard Blade Thickness** | 0.022" |
| **Electrical** | 115VAC 50/60Hz |

## ORDERING INFORMATION

Model 865 (115VAC only) includes:
1 x Diamond Band Saw Blade (#50182-01)
3 x Blade Guide (#50182-08)

| | | |
|---|---|---|
| **50182-65** | Model 865 Diamond Band Saw | each |

### Spare Parts and Accessories

| Description | Cat.# | Qty. |
|---|---|---|
| Diamond Band Saw Blade | **50182-01** | each |
| Top Friction Belt | **50182-05** | each |
| Bottom Friction Belt | **50182-06** | each |
| Blade Guide | **50182-08** | each |
| Lower Adjustment Screw | **50182-10** | each |
| Locking Nuts | **50182-11** | each |
| Plastic Arm | **50182-14** | each |
| Lower Shaft Assembly | **50182-15** | each |
| Lower Drive Wheel | **50182-16** | each |
| Upper Drive Wheel | **50182-17** | each |
| Lower Drive Wheel Bushing Assembly | **50182-18** | each |
| Water Coolant, 1qt (dilute 25:1 w/ water) | **50378-01** | each |
| SiC Dressing Stick (for blade dressing) | **50379-01** | each |

# INSTRUMENTATION

## UltraSlice Precision Slicing Machine

*Advanced slicing for most component sizes & shapes*

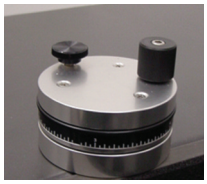
## Ultimate Versatility –
### the ULTRASLICE platform provides:

- **Work-holding and machine variables to enable most cutting jobs.**
- **Long-cuts and dicing modes also possible**
- **Motorized table provides unattended operation**
- **Provides 'end of the line' capability for manufacturers/labs already with larger production units**
- **Intuitive and easy to use**

Developed to facilitate precision sectioning applications in Industry and Research, ULTRASLICE Precision Saw provides the user with a unique combination of features:

### Versatile Sample Holding
The system may be readily converted to handle sample cutting requirements of most shapes, sizes, and applications – e.g. transverse and longitudinal slicing, right through to dicing.

### Cutting Accuracy
The use of precision lead screws on all sample feed mechanisms mean that cuts can be positioned accurately. The inbuilt 'Z-spindle' provides the ability to set the blade height 'on the fly'.

### Reproducible Results


All-metal construction and an accurately calibrated and damped spindle movement assures low transmission of vibration to the workpiece. This gives reproducibility of performance for cutting materials of widely varying mechanical properties; from the hardest steels and non-metallics down to delicate crystal materials.

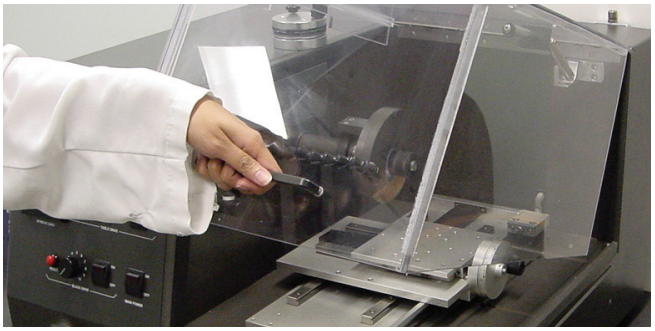
### Versatile Controls

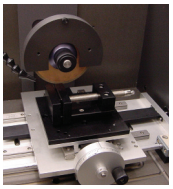

ULTRASLICE has the power and range of blade speeds to achieve higher cutting rates when necessary.

The system features an integral coolant recirculation system which extends blade life and clears cutting debris to improve cutting rate and surface quality.

ULTRASLICE can handle sample cutting requirements of all shapes, sizes and applications. Samples may be presented to the blade with table attachments (X, Y, W, and Z direction accessories).

The system accepts a wide range of O.D. diamond and abrasive blades for standard cutting, and is readily adaptable to accept





**Vise for ULTRASLICE, Cat No. 3575.1**
A vise attachment that mounts onto the ULTRASLICE saw by means of a standard set of dowels and two mounting screws.

The Vise Attachment holds a large variety of sample types and sizes.

**Lamp, Cat No. 1301.5**
A Convenient incandescent lamp for illuminating the work area.

- 60W Max bulb
- Illuminates Work area
- Gooseneck for control of illumination area

## SPECIFICATIONS

| | |
|---|---|
| **Power Requirements** | 110 - 240V, 50 / 60 Hz |
| **Spindle Speed** | Fully variable up to 6,000 rpm |
| **Spindle Size** | 0.5 inches (12.7 mm) |
| **Standard Stages** | Motorized Y, lead screw-fed X (indexing) and Z-spindle (blade height) |
| **Cutting Modes** | Preset Constant Speed |
| **Footprint** | 25 in. (wide) x 18 in. (high) x 25 in. (length) |
| **Unit Weight** | 110 lbs (45 kg) |

## ORDERING INFORMATION

| Cat. No. | Description | Qty |
|---|---|---|
| **8560.3** | ULTRASLICE Diamond Saw - 110V-240V | each |
| System package includes: Saw Base Unit, 6000rpm max spindle speed (with tachometer, ammeter), 3582.2 X Stage for traveling table, Y axis motorized traveling table (with automatic cut-out), Z-spindle Stage, Recirculating Coolant System & Splash Guard, One 4" diamond blade (7412.1), Pair 2" dia. flanges (cheek plates) | | |
| **6004.1** | Theta Stage | each |
| **3541.8** | Table Mounting Plate, with Quick Release interface | each |
| **3575.1** | Vise (for samples up to 2" dia.) | each |
| **1301.5** | Lamp | each |
| **Standard Blades for a wide range of sample types:** | | |
| **7412.1** | 4 inch o.d., 0.5 inch arbor, 0.012" inches (over diamond) thickness – premium metalbond blade | each |
| **7312.1** | 3 inch o.d., 0.5 inch arbor, 0.012" inches (over diamond) thickness – premium metalbond blade | each |



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## UltraSlice Compact

*Versatile Precision Saw for small workspaces & small budgets*

For the user who wants all the functionality and unique control of cutting parameters offered by a high end saw, while working on a tight budget or with limited lab space, ULTRASLICE Compact provides the answer.

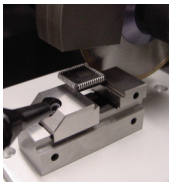
The system features an integral coolant recirculation system which extends blade life and clears cutting debris to improve cutting rate and surface quality.

Work is fed into the blade by several different methods, by use of table attachments.

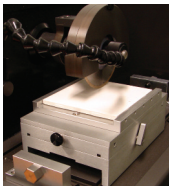
A wide range of workholders can be held by the saw. This method allows the workpiece to be mounted rapidly and conveniently without the need for mounting waxes or cements.

A fully splashguard enclosure is provided which may be opened to allow front panel access or be completely swung away from the cutting area.

For Industrial and research operations, ULTRASLICE Compact saw offers an unparalleled combination of cut quality, accuracy, versatility, and affordability.

**Vise attachment, Cat No. 3575.2**



**Compact Table with Substrate holder**

**Lamp, Cat No. 1301.5**

A Convenient incandescent lamp for illuminating the work area.

- 60W Max bulb
- Illuminates Work area
- Gooseneck for control of illumination area

**Automatic Cut-out Switch Assembly Cat No. 3632.1**

Allows for unatteded machine operation

### Product Highlights

#### Versatility

The system may be readily converted to handle sample cutting requirements of most shapes, sizes and applications.

#### Cutting Accuracy

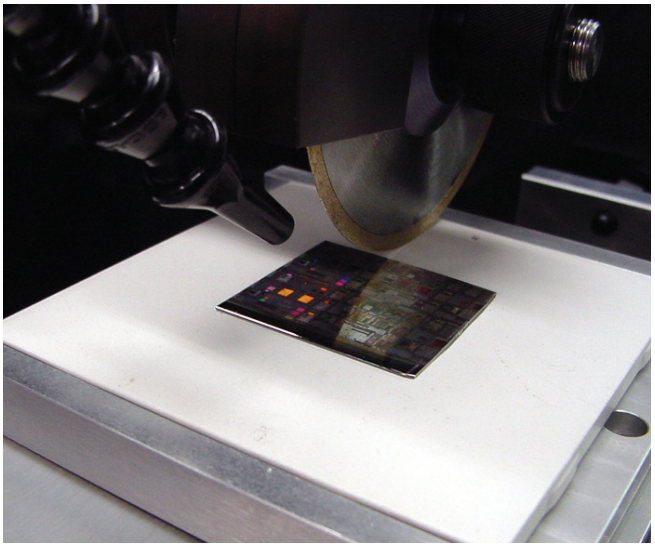
The use of precision lead screws on all sample feeds means cuts may be positioned accurately

#### Long Cuts & Dicing

The large work-table andl layout of the machine allows for long cuts to be achieved - perfect for failure analysis, and QA applications such as longitudinal sectioning of components. Sectioned workpieces may be an end in themselves, or the starting point for lapping and polishing

#### Most Blade Types

The system accepts a wide range of O.D. diamond and abrasive blades for standard cutting, and is readily adaptable to accept special 'dicing' blades for the smallest kerf.



### ORDERING INFORMATION

| Cat. No. | Description | Qty |
|---|---|---|
| **8520.3** | ULTRASLICE Compact | each |
| System package includes: Saw Base Unit (2000 max rpm spindle speed), 3582.C X Stage for traveling table, Y axis motorized traveling table, Recirculating Coolant System & Splash Guard, One 4" diamond blade (7412.1), Pair 2" dia. flanges (cheek plates), 100-240V Operation. | | |
| **3518.4** | Substrate Holder -- table mount | each |
| **3575.2** | Vise -- table mount | each |
| **1301.5** | Lamp | each |
| **3632.1** | Automatic Cut-out Switch and Assembly, for unattended operation | each |

# INSTRUMENTATION

## UltraSlice Precision Macrotome

*Precise sectioning of hard tissue & other materials*


ULTRASLICE Macrotome precision diamond saw, is a quiet, direct drive design for smooth, chatter free slicing system for important and fragile industrial, biological and related specimens.

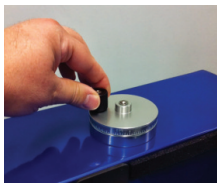
The system suits Fish & Game applications, such as Otolith and Statolith samples. Specimens can be oriented to ensure a flat surface is parallel to the desired section plane such as sagittal, frontal or transverse.

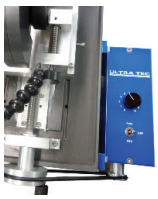
MACROTOME can also be used in many other industrial applications where the best price/perfomance ratio is required.

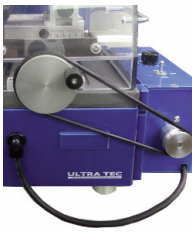
The wheel (spindle) rotation is variable speed, to allow for optimized cut quality .An easy access coolant reservoir, allows for quick efficient coolant changes.

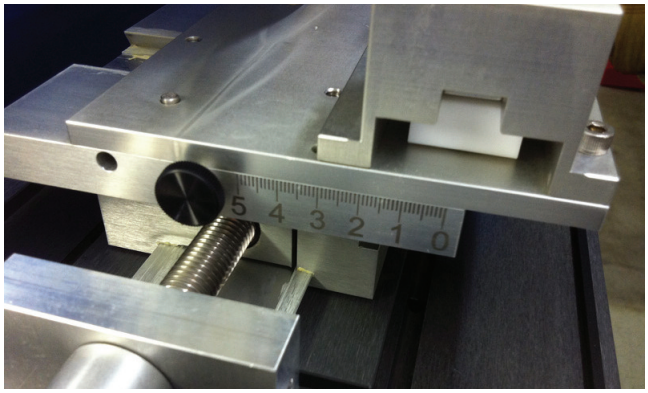
### FEATURES:

- Suits Low Budgets
- Z-Spindle
- Manual Crank Table Feed, with motor option
- For otoliths and related specimens
- Fish & Game





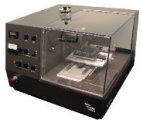




### ORDERING INFORMATION

| Cat. No. | Description | Qty |
|---|---|---|
| **8550.1** | ULTRASLICE Macrotome Saw | each |
| **8555.1** | Table Autofeed | each |
| **3541.8** | Table Mounting Plate, with Quick Release interface | each |
| **3575.1** | Vise (for samples up to 2" dia.) | each |
| **1301.5** | Lamp | each |
| **Standard Blades for a wide range of sample types:** | | |
| **7412.1** | 4 inch o.d., 0.5 inch arbor, 0.012" inches (over diamond) thickness – premium metalbond blade | each |
| **7312.1** | 3 inch o.d., 0.5 inch arbor, 0.012" inches (over diamond) thickness – premium metalbond blade | each |

## Precision Saw Selection Guide — Which Slicing Machine Is Right for You?

| | Model | Cat. No. | Motorized Y Table | Length, Y-table Travel, In. (cm) | Y-table Automatic Cut-out Switch | Length, X-table Travel In. (cm) | X-Axis Cut Thickness Indicator | Ammeter Cutting | Vise Holder | Substrate (Dicing) Holder |
|---|---|---|---|---|---|---|---|---|---|---|
|  | **UltraSlice** | 8560.3 | Standard Feature | 9.75 (25cm) | Standard Feature | 5.25 (13cm) | Standard Feature | Standard Feature | Option | Option |
|  | **UltraSlice Compact** | 8520.3 | Standard Feature | 4.5 (11cm) | Option | 4 (10cm) | Option | – | Option | Option |
|  | **UltraSlice Macrotome** | 8550.1 | Option | 7.5 (19cm) | – | 4 (10cm) | Option | – | Standard Feature | Option |
|  | **UltraTrim** | 8505.1 (110V) 8505.2 (220V) | – | – | – | – | – | – | – | – |



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## UltraTrim Diamond Saw

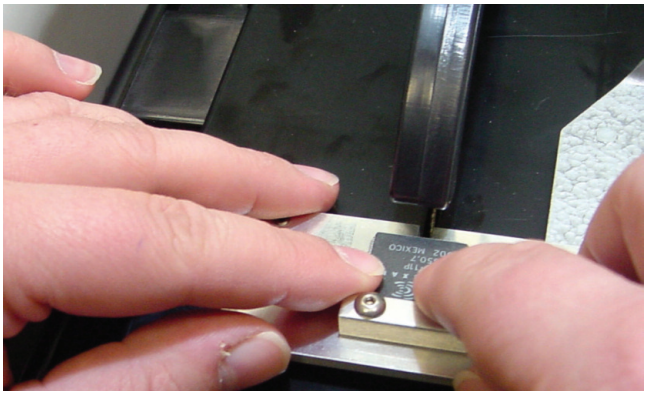
*A refreshing idea for sample preparation*

ULTRATRIM is a low cost, entry-level, precision sawing machine for producing rapid cross-sections for microscopy and QC checks.

The saw includes a straightforward coolant reservoir, the saw blade dips into the reservoir for effective cooling and lubrication of the sawing process. An intelligently designed manually fed cutting table, makes slicing fast and easy. The saw has a fully variable spindle speed and a small footprint.

### FEATURES:

- Accepts 4 inch o.d. blades, with standard 0.5 inch spindle
- Quiet, powerful motor with speed control
- Manual Table-fed cutting for fast, convenient sample prep
- Convenient reservoir for blade coolant and lubrication
- Economical



### ORDERING INFORMATION

| Cat. No. | Description | Qty |
|---|---|---|
| 8505.1 | ULTRATRIM Saw with 0.5 inch arbor spindle, 0.25 hp motor, integral coolant reservoir, manual table feed, one 4" o.d. blade, 110V operation only | each |
| 8505.2 | ULTRATRIM Saw with 0.5 inch arbor spindle, 0.25 hp motor, integral coolant reservoir, manual table feed, one 4" o.d. blade, 220 - 240V operation | each |
| 7412-1 | Spare 4” diameter blade, 0.012” thick | each |
| 7312-1 | Spare 3” diameter blade, 0.012” thick | each |

| Z-Spindle | Quick Release Interface | Spindle Arbor Size, In. (mm) | Standard Blade Sizes (In. OD) | Max. Cutting Torque – 1 (lowest) -5 (highest) | Max. Blade Speed (RPM) | Electrical | Footprint Length x Depth, In. (cm) | Height In. (cm) | Weight lbs (Kg) |
|---|---|---|---|---|---|---|---|---|---|
| Standard Feature | Option | 0.5 (12.7mm) | 3, 4, 5, 6 | 5 | 6,000 | SinglePhase 110-240V (50/60Hz) | 27 x 25 (68cm x 63cm) | 21 (53cm) | 145 (66Kg) |
| Option | Option | 0.5 (12.7mm) | 3, 4, 5 | 4 | 1,800 | Single Phase 110-240V (50/60Hz) | 15 x 18 (38cm x 45cm) | 17.5 (44cm) | 90 (41Kg) |
| Option | Option | 0.5 (12.7mm) | 3, 4, 5 | 2 | 2,500 | Single Phase 110-240V (50/60Hz) | 15 x 19 (38cm x 48cm) | 17.5 (44cm) | 90 (41Kg) |
| – | – | 0.5 (12.7mm) | 4 | 3 | 2,500 | Single Voltage Only, 110V, 220V versions | 15 x 11 (38cm x 28cm) | 9 (22cm) | 9 (4Kg) |

# INSTRUMENTATION

## Model 200 Dimpling Grinder

*An easy-to-use, state-of-the-art, mechanical thinning instrument designed for the reproducible preparation of high-quality electron microscopy specimens.*


### FEATURES:

- Prethin specimens for ion milling
- Polish specimens to electron transparency
- Controlled grinding force and rate
- Vibration-free grinding
- Precise indication of specimen thickness
- Easy to program
- Accepts mounted specimens from the Model 160 Specimen Grinder
- Optional 40 X microscope attachment allows direct observation of the specimen without the need to remove it

### Ideal specimen prep for ion milling

The ultra-precise Model 200 Dimpling Grinder is indispensable when ion milling is used for final specimen thinning. Because the specimen is prethinned by dimpling, ion milling must remove only relatively small amounts of material. This creates specimens free from uneven thinning, surface defects, and irradiation damage.

### Versatile

By simply changing tools, the dimpling grinder can be used to flat grind bulk specimens, dimple, and then finally polish the specimen to electron transparency.

### Precise specimen positioning

A key component of the dimpling grinder is the specimen stage that precisely rotates the specimen. The specimen is mounted with a low melting point polymer to the top half of a two-piece platen. The platen fits into a magnetic base, which is coupled to the specimen stage by a rare-earth magnet. This magnetic coupling allows the base to be positioned so that a particular area of the specimen can be precisely placed under the grinding wheel. Positioning can be observed through a 40 X optical microscope.

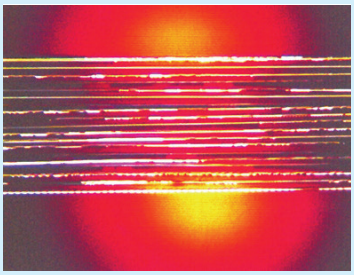
The specimen can be readily removed for inspection and then precisely repositioned for continued grinding. Specimen rotation speed is continuously varied by a front panel mounted potentiometer.

## Dimpling

High-quality specimens for transmission electron microscopy (TEM) need to have a large electron transparent area for analysis, but yet be rugged. One method that accomplishes both of these prerequisites is dimpling.

Dimpling is a rapid technique that involves simultaneously rotating the specimen on one axis and a grinding wheel on a perpendicular and intersecting axis. This combination of motions provides a specimen with its central area reduced to a thickness of a few microns.

By thinning only the central area of the specimen, a thick, rugged outer rim remains, eliminating the need for special handling techniques for fragile specimens. An abrasive slurry that is in contact with the grinding wheel and the specimen removes the material.



*Optical image of a dimple ground XTEM specimen consisting of 19 individual sections of a microelectronic material.*

*The image was taken using transmitted light and shows a color contrast due to the decreasing thickness of silicon as the center of the specimen is approached.*

### Optimized grinding control

For effective preparation and to avoid specimen damage, an electromechanical stage lowers the grinding wheel at an optimized rate. This creates a very controlled reduction of specimen thickness.

Wear on the grinding wheel is uniform, virtually eliminating eccentric tool-induced vibration and ensuring grinding without the risk of specimen fracture.

At the conclusion of the grinding process, the advanced instrument control halts both the wheel and specimen rotation and then automatically lifts the grinding wheel from the specimen surface.

### Vibration-free grinding

The precision fit of the grinding wheel to the shaft minimizes eccentricity. Both advanced rotary bearing technology and a specially designed drive system virtually eliminate wheel vibration. Grinding wheel rotation speed is continuously adjustable via a front panel mounted potentiometer.

The dimpling grinder can incorporate different types of wheels:

- Grinding wheels for rapid material removal without scratching.
- Polishing wheels for an optimal surface finish.
- Wheels with different diameters for various dimple profiles.

A variety of wheel materials are available and can be specially matched to given applications.

### Controlled grinding force and rate

The grinding wheel stage is pivoted to present the grinding wheel to the specimen. It contains a micrometer-type, adjustable counterweight system to regulate the applied grinding force. The controlled grinding force and rate produces specimens with exceptional quality.

### Easy programming

Programming is extremely easy via a keypad mounted on the front panel. Prompts guide you through quick and easy programming steps. A liquid crystal display continuously shows performance information.


*Dimpling grinder programming panel*

A zero position can be established on either the surface of the platen or the surface of the specimen. This enables you to either dimple to a given thickness or to remove a specific amount of material from the specimen.

### Process termination

Final specimen thickness is readily programmed for accurate, unattended operation. However, at any time, the process can be either paused for specimen inspection or stopped. During grinding, specimen thickness is continuously displayed.

The dimpling grinder also features a time-based polishing mode. At the conclusion of an elapsed set time, the process automatically terminates.

## Model 200 Dimpling Grinder (continued)

### Transmitted or reflected illumination

The platen that holds the specimen has a glass center section that allows light to be transmitted through the specimen from a source located beneath the specimen stage. The intensity level of the transmitted light is adjustable for optimal specimen observation. This is particularly important when dimpling silicon, which undergoes changes in color as the specimen approaches electron transparency.

The dimpling grinder also features illumination with reflected light from a high intensity lamp, powered by the dimpling grinder's power supply.

### Microscope for direct observation

A 40 X microscope attachment allows direct observation without the need to remove the specimen.

## SPECIFICATIONS

| | |
|---|---|
| **Grinding Control** | Automated grinding rate control |
| | Grinding force adjustable with micrometer counterweight system |
| | Independent control of grinding wheel and specimen rotation speeds |
| **Specimen Stage** | Precise specimen stage rotation |
| | Magnetic mount allows easy specimen positioning |
| **User Interface** | All program inputs via front panel keypad |
| | Specimen thickness indicated on a liquid crystal display |
| **Specimen Illumination** | Specimen observation in either transmitted or reflected light |
| **Enclosure** | Weight: 18 lb (8.2 kg) |
| | Size: 8.2 in (208 mm) width x 6.5 in (165 mm) height x 13.5 in (343 mm) depth |
| **Power Requirements** | 110/220 V AC, 50/60 Hz, 375 W |
| **Warranty** | One year |

## ORDERING INFORMATION

| Cat. No. | Description | Qty. |
|---|---|---|
| **50178** | Model 200 Dimpling Grinder, with country-specific power cord | each |
| **Items included with the Model 200 Dimpling Grinder:** | | |
| **Cat. No.** | **Description** | **Qty.** |
| **50178-01** | Aligning Ring: Magnetic Base | each |
| **50178-02** | Flattening Ring: Micarta | each |
| **50178-03** | Grinding Wheel: Wood | each |
| **50178-04** | (3) Platen: 0.75" diameter | 3/pk |
| **50178-05** | Platen Assembly: Glass | each |
| **50178-06** | Platen Holder | each |
| **50178-07** | (3) Grinding Wheel: Micarta | 3/pk |
| **50178-08** | Flattening Wheel: Stainless Steel | each |
| **50178-09** | (2) Grinding Wheel: Stainless Steel | 2/pk |
| **50178-10** | Grinding Wheel: Phosphor Bronze | each |
| **50178-11** | Wheel Locking Nut | each |
| **50178-12** | Slurry Retainer Assembly | each |
| **50178-13** | Lamp Beam Block | each |
| **50178-14** | Wheel Hub Assembly | each |
| **50178-15** | Semiconductor Polishing Wheel | each |
| **50178-16** | Microscope Attachment | each |
| **50178-17** | Extended Base: Magnetic Platen | each |
| **50178-18** | Wrench: Ball End Hex Key - 1/16" - Steel | each |

## Model 160 Specimen Grinder

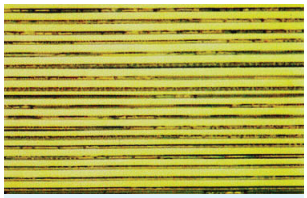
*Mechanically prethins specimens for transmission electron microscopy (TEM). Greatly reduces the time spent during the final preparation process of ion beam milling.*

## FEATURES

- Accurate and dependable
- Precisely controlled
- Specimens up to 18 mm diameter
- Large diameter provides excellent stability
- No additional force needed
- Consistently produce specimens with uniform thickness and parallel sides
- Platen transferable to the Model 200 Dimpling Grinder

Mechanically prethin specimens The Model 160 Specimen Grinder is an accurate and dependable tool for mechanically prethinning specimens in preparation for transmission electron microscopy (TEM). The grinder accommodates up to 18 mm diameter specimens.

The specimen grinder greatly reduces the time spent during the final preparation process of ion beam milling, which is typically used to achieve electron transparency.



*Optical image of an XTEM specimen consisting of 19 individual sections of a microelectronic material.*

*Produced by ultrasonic disk cutting and mechanical grinding.*

A graduated scale allows the specimen thickness to be easily and precisely controlled; rotating the control knob advances the specimen 0.5 mm per rotation.

The large diameter provides excellent stability. Specimens with uniform thickness and parallel sides are consistently produced because of the precise fit of the specimen platen into the grinder body. The grinder is heavy enough to provide sufficient grinding force on the specimen.

### One-step mounting

If further thinning via dimpling is required, the platen containing the specimen is simply ejected from the specimen grinder and installed directly into the Model 200 Dimpling Grinder.

This eliminates any possibility of damaging the specimen by demounting it for dimpling.

## SPECIFICATIONS

| | |
|---|---|
| **Specimen Size** | Up to 18 mm diameter |
| **Dimensions** | 3.0 in (76 mm) diameter x 2.6 in (66 mm) height |
| **Weight** | 2.4 lb (1.1 kg) |
| **Warranty** | One year |

## ORDERING INFORMATION

**Includes:** (4) Platen: 0.75" diameter, Platen Holder

| Cat. No. | Description | Qty |
|---|---|---|
| **50179** | Model 160 Specimen Grinder | each |
| **Options** | | |
| **50179-01** | Goniometer Platen | each |
| **50179-02** | Specimen Lapping Kit | each |

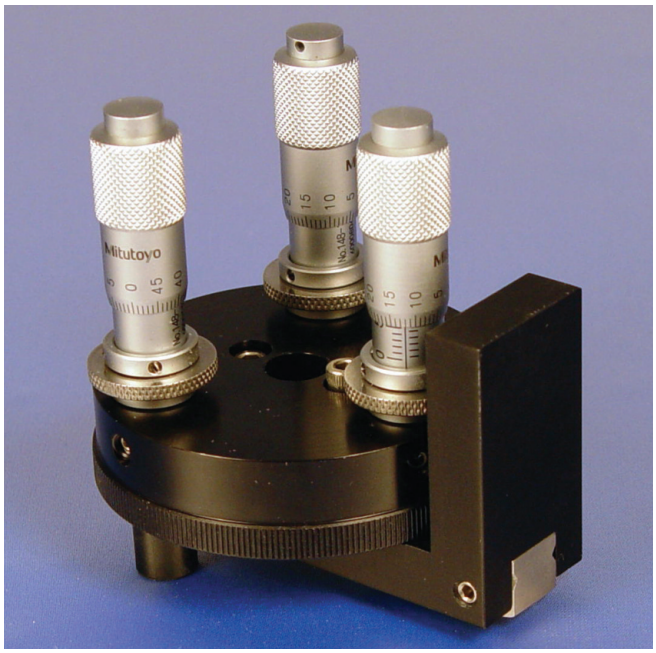
# Model 590 Tripod Polisher — TEM/SEM Sample Preparation

The Tripod Polisher® was designed by scientists at IBM, which is used to prepare accurately micro sizes of TEM and SEM samples. For TEM samples, the Tripod Polisher® has been used successfully to limit ion milling times to less than 15 minutes, and in some cases, has eliminated the need for ion milling. It can be used to prepare both plan-view and cross-sections from a variety of sample materials, such as ceramics, composites, metals and, geological specimens.

It is also used to delayer / deprocess semiconductor sample (thin top down). To get the best results with the tripod, ideally the sample should be <5 x 5 mm – otherwise, the process creates rounding which overpolish targets.

## ADVANTAGES:

- **Limited ion milling requirements reduce preferential thinning, radiation damage, and heating of the sample.**
- **No strong chemicals are used to prepare the specimen.**
- **The same sample can be studied with both SEM and TEM.**
- **Reduces sample preparation.**
- **Samples can be prepared for TEM without ion milling.**




## Tripod Polisher® Accessories:

### The Tripod Polisher® Base (#50116-05):
holds the micrometer and has two captive screws that hold the L-Brackets or the Parallel Polishing Mount in position when polishing the samples.

### The Precision Locking Micrometers (#50116-10):
have special larger diameter locking rings for easy locking and are graduated in one micron increments with 13mm travel. Non-coating Micrometers also available, but not recommended.

### The Slotted L-Bracket (#50116-30):
is used in exactly the same way as the Screw Clamp L-Bracket. The difference is the method of clamping. With the Screw Clamp L-Bracket, the Pyrex Insert, SEM Stub is held with two setscrews. With the Slotted L-Bracket they are held with a form fix clamp that is tightened with a single screw. The Inserts are held tightly with a good thermal contact for mounting samples when the L-Bracket is heated on a hot plate. When examining the mounted sample under a microscope it can be lit from the bottom as well as the side.

### X-Section L-Bracket (#50116-31):
is used to mechanically clamp a sample (such as an IC Package) on the side of an L-Bracket for optimal SEM cross sectioning.

### The Parallel Polishing Mount (#50116-35):
is mounted in the center of the Tripod Polisher(r) Base in place of the L-Bracket and is used for parallel polishing by adjusting the 3 micrometer feet.

### The Planarizing Tool (#50116-40):
is used to lap the three delrin feet to be coplanar in preparation for preparing samples with Parallel Polishing Mount.

### The Microscope Stand (#50116-55):
is used to hold Model 590 Tripod Polisher(r) with sample facing up for viewing under a microscope or serve to protect the sample.

### The Heater Block (#50116-50):
is designed to hold any of the L-Brackets while they are being heated on a hot plate prior to mounting sample melted wax. This provides a slow, uniform temperature gradient, which minimizes thermal shock.

### The Pyrex Insert for Wedge Polishing (#50116-60):
is used with the Screw Clamp and Slotted L-Bracket for mounting sample for the TEM

### The Wedge Polishing Mount (#50116-61):
includes a Wedge Polishing Clamp (#50116-62) and 5 of Pyrex Wedge Polishing Rod (#50116-63). This holder is used for TEM Wedge Polishing and provides a small sample mounting area allowing for maximum adjustment range of the sample.

### The Pyrex Wedge Polishing Rod (#50116-63):
is a replacement part used with the model #50116-35 Wedge Polishing Mount.

### The Pyrex Wedge Polishing Stub (#50116-64):
is mounted to a Pyrex Insert (#50116-60) to produce a similar effect as is accomplished with the model #50116-61.

### The SEM Stub (#50116-65):
is used for mounting samples for SEM and can be transferred directly to the SEM or to the special holder for use in mil.

### The Glass Leveling Slide (#50116-70):
is used for leveling the 3 micrometer's feet or 2 of the feet and the sample.

### The Tool Kit (#50116-75):
contains 2 hex drivers (#50116-71 & #50116-72) and torque handle for use with the Model 590 Tripod Polisher® in addition to wrench (#50116-73) for micrometer repair.



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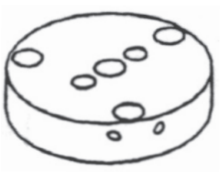
## Model 590 Tripod Polisher-TEM/SEM Sample Preparation (continued)

### ORDERING INFORMATION Optional and Included parts with Tripod Polishers: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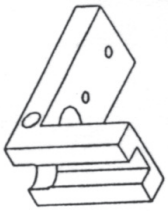
50116-15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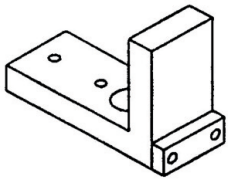
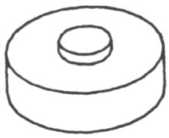
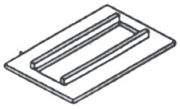

50116-31


50116-35


50116-36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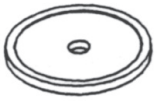
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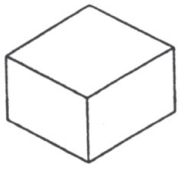
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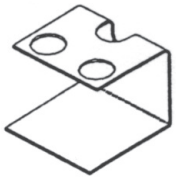
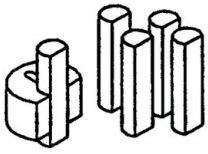

50116-55


50116-60


50116-61


50116-62


50116-63


50116-64


50116-65


50116-70

| Part Description | Cat. No. | Model 590TEM | Model 590SEM | Model 590TS (TEM & SEM) |
|---|---|---|---|---|
| Tripod Polisher Base | **50116-05** | Included | Included | Included |
| Precision Micrometer | **50116-10** | Included x3 | Included x2 | Included x3 |
| Slotted L Bracket | **50116-30** | Included | ---------- | Included |
| Cross Section L Bracket | **50116-31** | Optional | Optional | Optional |
| Parallel Polishing Mount (plastic) | **50116-35** | Optional | Optional | Optional |
| Parallel Polishing Mount (S. Steel) | **50116-36** | Optional | Optional | Optional |
| Planarizing Tool | **50116-40** | Optional | Optional | Optional |
| Support Collars | **50116-45** | ---------- | ---------- | ---------- |
| Heater Block | **50116-50** | Included | ---------- | Included |

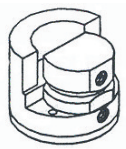
| Part Description | Cat. No. | Model 590TEM | Model 590SEM | Model 590TS (SEM+TEM) |
|---|---|---|---|---|
| Microscope Stand | **50116-55** | Included | Included | Included |
| Pyrex Insert - Large | **50116-60** | Included | ---------- | Included |
| Wedge Polishing Mount | **50116-61** | Optional | Optional | Optional |
| Wedge Polishing Clamp | **50116-62** | Included | ---------- | Included |
| Pyrex Wedge Polishing Rod | **50116-63** | Included x 4 | ---------- | Included x4 |
| Pyrex Wedge Polishing Stub | **50116-64** | Included | ---------- | Included |
| SEM Stub | **50116-65** | ---------- | Included x4 | Included x4 |
| Glass Leveling Slide | **50116-70** | Included | Included | Included |
| Tool Kit | **50116-75** | Option | Option | Option |

| Cat. No. | Description | Qty. |
|---|---|---|
| **50115-10** | Tripod Polisher Model 590 TEM | Set |
| **50115-20** | Tripod Polisher Model 590 SEM | Set |
| **50115-30** | Tripod Polisher Model 590TS (SEM+TEM) | Set |

## Ion Mill Stage, Model 59001

The Ion Mill Stage is designed to accept the special SEM stub used with the Tripod Polisher. The SEM stub is mounted to the Ion Mill Stage and the samples are briefly ion milled in order to remove fine scratches, polishing debris and to give the surface topography prior to SEM analysis.

| Cat. No. | Description | Qty. |
|---|---|---|
| **50118-01** | Ion Mill Stage, Model 59001 | each |


50118-01

## Starter Kit:

This starter kit is designed to provide all of the necessary supplies needed for sample preparation in use with the Tripod Polishers.

| Cat. No. | Description | Qty. |
|---|---|---|
| **50118-05** | Kit includes: Set of Diamond Lapping Film (1 each of 0.5, 1, 3, 6, 15, and 30 back); Multitex Polishing Cloth; 8" Glass Plate; 0.05µm Colloidal Silica; Mounting Wax; Squeegee; Slotted TEM Grids, Sample Cleaner; Cotton Swab 50/pk); Petri Dish, Filter Paper, Tweezers set, and Scotch Pad | each |

# INSTRUMENTATION

## ASAP-1 IPS Digital Selected Area Preparation System

### Product Highlights

- Suits all sizes of die - package, wafer and board-level
- Real Time Video Monitor with system parameter
- Touchscreen control with physical joystick & controls
- Rigidized Table Assembly and closed-loop, high-torque, motor control enhances the machining of tough and hard materials
- X, Y and Z axes all have deep sub-micron accuracy
- Accurately decaps, then thins substrate and polishes
- Patented Floating Head provides a true polishing action -- yields polishing quality & high survivability
- Intuitive menus provide a powerful, easy to use, system
- USB Flash Driveinterface for preparation recipe storage
- Short set-up and process times
- Accurate die-tilt adjustment 'on the fly'
- Bench-top & Quiet in Operation

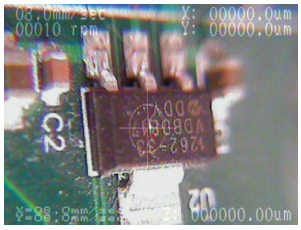
Since product launch, ASAP-1® hardware has become the standard piece of preparation equipment that engineers involved in disciplines such as failure analysis, yield enhancement, radiation testing, and competitive analysis have come to rely on for backside preparation. ULTRA TEC has produced leading solutions for backside preparation since 1999. With over 300 ASAP-1 units installed in Semiconductor industry labs throughout the world, we are proud to introduce the ASAP-1® IPS.

### Enabling The Next Generation Of Failure Analysis

Ever since the inception of the ASAP-1 Project, ULTRA TEC's goal has been to offer both user-friendly and sample-friendly tools. The ASAP-1® analog systems offer elegant, intuitive controls which have enabled all labs to achieve quality results for subsequent analysis with Photon emission microscopes, laser/ thermal stimulus microscopes and FIB's. The user-friendly intutive nature of the analog units has been carried forward, and expanded with ASAP-1® IPS.

### Digital Control... Done Right!

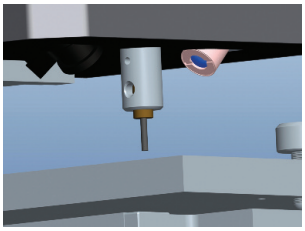
ASAP-1® IPS offers deep sub-micron control on X, Y and Z axes, making it 'hands-down' the most accurate system ever seen in the market.



*IPS real time monitor shows X, Y & Z Positions, speeds feeds & tool diameter*

### Much More Than A Mill

ASAP-1® IPS enhances the market-leading attributes of our legacy products with the latest digital technology. It is now possible to grind substrates thinner, polish flatter and de-process even more accurately. ASAP-1® IPS introduces a suite of features that automate many aspects of the process – from analyzing the part to be processed, to writing intuitive programmable recipes, to reading in-situ end-stop indicators that ensure each important sample is prepared correctly. The patented 'float down' polishing head design is retained, and enhanced with the use of force feedback. to achieve the quality of final polish demanded by customers for backside microscopy, Laser scan, FIB and SIL.



*Machine vision, laser scan, & illumination provide feedback of system parameters*

### Improved System Controls

The dedicated machine-vision monitor provides an 'always on' realtime view of the part, overlaid with current system coordinates and parameter. Now you can see the part as it is being processed!

A touchscreen interface, a physical joystick and encoders -- alongside a suite of intuitive software and hardware features -- empowers the FA technician & engineering professional for the next generation of failure analysis.

*The Touchscreen offers a powerful user interface - enhanced by physical controls*

### SPECIFICATIONS

**Z-Vertical Direction Precision:** 0.04 microns (40 nanometers)
**Table Precision (X& Y Travel):** 0.2 microns (200 nanometers)
**Table Travel Amplitude:** 100mm x 100mm
**Polishing Method:** Patented ASAP-1 Float-down head, with Z-lock, enhanced with electronic sensors and tool patterns
**Video:** Real-time machine vision with 6.5 inch video monitor. External Video Output (NTSC)
**Programming Input Method:** Touchscreen with joystick and 3 physical rotary encoders
**Machine Vision:** Real-time Video of overlaid with stage and process variables.
**Tilt Control:** Computer-aided 2-circle tilt control, ULTRACOLLIMATOR Measurement (option)
**Force Control:** 1000grams (max) with 1 gram precision. Overall accuracy +/- 10 grams
**Recipe Load & Save:** USB Port, for removable flash drive (up to 2Gb)
Z Position Touch-off Method Mechanical Positioning with Force-feedback (option) sensors.
**X & Y Position:** LASER Targeting
**Power Consumption:** 300 Watts Maximum in use
**Power Requirements:** Universal: 100-120VAC; 200-240VAC
**Footprint:** 19 inches (480mm) Width x 25 inches (635 mm) Depth x 22 Inches (560mm) Height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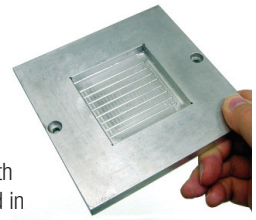
## ASAP-1 IPS Digital Selected Area Preparation System (continued)

### Accessories

### Wax-In Plate

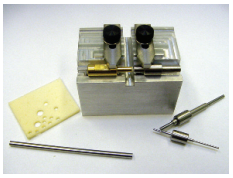
*Holds difficult packages*



The Wax-in plate allows for packages with long vertical leads ("dead bug") or those with 'difficult' or non-standard shapes to be held in position for Selected Area Preparation.

- **Works with paraffin wax or similar adhesives**
- **Holds dead-bug type packages**

### XYBOVE Re-application Tool

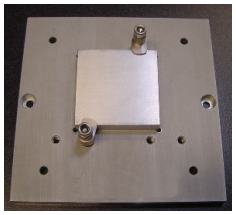


Re-mounting station for Xybove final polishing tips. The XYBOVE Re-Application Tool makes replacing XYBOVE Tips straightforward and rapid -- especially on smaller 1mm and 2mm diameter tools.

- **Make Replacement XYBOVE Tips when required**
- **Save on buying new tools**
- **Fast and Convenient to use, especially on small diameter tools**

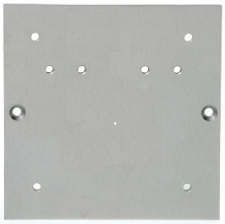
### Flip-over Workholder

*Allows optical alignment of non-optically-accessible parts*



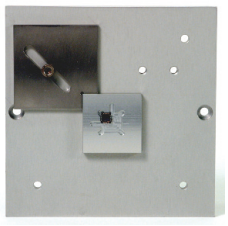
Re-mounting station for Xybove final polishing tips. The XYBOVE Re-Application Tool makes replacing XYBOVE Tips straightforward and rapid -- especially on smaller 1mm and 2mm diameter tools.

### ASAP-1 Standard Mounting Plate



Standard Mounting Plate for ASAP-1 systems. Mounts on to the system with four corner dowel holes and screw holes for even stronger mounting, if required. Includes flat, ground and lapped anodized aluminum surfaces, with a center optical alignment for use with the ULTRACOLLIMATOR. Tapped holes are include for mechanical mounting with wafer clamps or similar.

### ASAP-1 Repeat Positioning Holders



Holders that work with the Standard Mounting Plate for ASAP-1 systems. Repeat Holders -- namely the Corner Square and the Small wax-in holder -- allow for many of the same part to be sequentially processed, without the need for re-centering or recalibration of the ASAP-1® system.

### Particulate Vacuum Pump

- **Used with ASAP-1® IPS**
- **Providesthe safest working conditions, particularly when dry grinding encap-sulants and electronic components**
- **Quiet and Efficient**
- **HEPA filter**
- **Allows best viewing in machine vision mode**
- **Driven by ASAP-1® IPS Software**

## ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **6760.1** | **ASAP-1® IPS with Optical Control** | each |
| DIGITAL Selected Area Preparation System, 100-240V, 50/60Hz. Includes: X-Y table, tool spindle drive with deep sub-micron micron Z-resolution, compound sine tilt-table, touchscreen programming unit, ULTRACOLLIMATOR optical alignment, integrated real-time machine vision, 6.5 inch lcd monitor, set of 2mm and 3mm tools. | | |
| **6760.2** | **ASAP-1® IPS** | each |
| DIGITAL Selected Area Preparation System, 100-240V, 50/60Hz. Includes: X-Y table, tool spindle drive with deep sub-micron micron Z-resolution,tilt-table, touchscreen programming unit, integrated real-time machine vision, 6.5 inch lcd monitor, set of 2mm and 3mm tools. | | |
| **6715.1** | **High torque Motor (upgrade)** | each |
| 3X Torque motor. Suits aggressive material requirements such as removal of thick heat-sinks, removal of metals. | | |
| **6389.1** | **Force Feedback Module** | each |
| System upgrade to add force feedback software for preparing delicate samples and dice for exhibiting in-package curvature. | | |

### 3D Upgrade Modules

| | | |
|---|---|---|
| **6394.1** | **Curvature Correction** | each |
| Adds sample curvature definition – Suits decapsulation, thinning, and polishing of packaged dice showing warpage or non-flat conditions. Independent X & Y Axis Correction, AUTOCURVE Mode. Also adds Stage AUTOTILT function | | |
| **6366.1** | **Thermal Relaxation Stage** | each |
| Adds thermal relaxation capability for warped die. Peltier-based heating plate with 1C accuracy. Hot Plate mode for convenient sample mount/demount. Includes stage, cable, two custom mounting plates with nylon retention screws | | |

### Characterization Modules

| | | |
|---|---|---|
| **6368.1** | **End-Point Module** | each |
| High impedance / small capacitance based -- Hardware and Software Upgrade to add end-pointing for enhancement of decap, deprocessing, and polishing. | | |

### Accessories

| | | |
|---|---|---|
| **6373.1** | Wax-in Mounting Plate | each |
| **6316.1** | XYBOVE Re-Application Tool. | each |
| Supplied with 3 sheets of Xybove and tools for manufacture of 1mm, 2mm, 3mm and 5mm Xybove tips. | | |
| **6388.1** | Flip-over Sample Holder | each |
| Allows for ULTRACOLLIMATOR alignment of packages and samples that have no access for 'opposite-side' alignment. | | |
| **6371.1** | Standard Mounting Plate for ASAP-1 | each |
| **6386.1** | Repeat part Corner Square | each |
| **6327.1** | Small Wax-in Mounting Plate | each |
| **6780.1** | Particulate Vacuum Pump for ASAP-1® IPS | each |
| Supplied with collection hose hardware -- 110V only | | |
| **6780.2** | Particulate Vacuum Pump for ASAP-1® IPS | each |
| Supplied with collection hose hardware for -- 220 to 240V only | | |

# INSTRUMENTATION

## Model 900 - Grinding and Polishing Machine

This light weight, bench top Grinding/Polishing model is ideal for surface preparation of small metallographic specimens. It is adjustable in speed from 0 to 1725 RPM, and has ⅓ HP and it is fully grounded. The coolant is applied to the wheel through an adjustable flow control goose-neck spout. The unit comes complete with a compression fitting for an easy connection into the existing coolant supply. Measures: 13" x 15.25" x 9.5" (H); Weight 35 lb. 110 volt, 60Hz.

### ORDERING INFORMATION

**Model 900 Includes:** Aluminum lapping plate, Lapping plate removal wrench, Metal holding band (for plain back paper).

| | | |
|---|---|---|
| **50120-10** | Model 900 | each |
| **50120-20** | Model 900CE (converted to comply with CE) | each |

### SPECIFICATIONS

| | |
|---|---|
| **Dimensions** | 13" x 15.25" x 9.5" |
| **Net Weight** | 35 lbs |
| **Motor Speed** | 0-1725 RPM (continuously adjustable) |
| **Motor** | 1/3 HP |
| **Grinding Plate Diameter** | 8" |
| **Electrical Input** | 90-120 VAC; 50/60 Hz<br>200-240 VAC; 50/60 Hz |

### Accessories and Spare Parts

| Cat. No. | Description | Qty. |
|---|---|---|
| **50120-50** | 8" Aluminum Lapping Plate | each |
| **50120-51** | 8" Glass Lapping Plate (used with plain back lapping film) | each |
| **50120-60** | Metal Holding Band | each |
| **50120-61** | Rubber Splash Guard | each |
| **50120-62** | Metal Splash Guard | each |
| **50120-70** | Motor Controller, 110 VAC | each |
| **50120-72** | Motor Controller, 220 VAC | each |

## Model 910 - Lapping and Polishing Machine

This model 910 is specially designed to provide all of the features required to obtain outstanding results using the EMS Polisher. The Polisher is designed for SEM cross sectioning and also for TEM wedge polishing preparation. For instance, TEM wedge polishing requires that the polishing wheel rotates at a constant speed with high torque at a very low rpm. This combination of features is not found in standard grinders. Our model 910 provides all of the requirements that a Tripod Polisher needs. This includes the use of diamond lapping films and either colloidal silica or colloidal alumina suspensions. Plain backed diamond lapping film adhered to a glass plate by surface tension, and is easily removed for storage and re-use. Model 910 is also designed for ease of cleaning and disposal of abrasive debris.

### FEATURES:

- Variable speed from 8 - 600 RPM
- Solid, cast aluminum construction
- Vibration free, quiet operation
- Low speed, high torque rotation (makes it ideal for Tripod Polishing)
- Stylish, tabletop design

### ORDERING INFORMATION

**Model 910 includes:** Water and slurry delivery system, Aluminum lapping plate (includes O-ring #50122-30 for metal holding band), Metal holding band (for holding abrasive papers and polishing cloth, #50122-31), Glass plate, Dust cover, Hex wrench set

| | | |
|---|---|---|
| **50122-10** | Lapping and Polishing Model 910 | each |

### SPECIFICATIONS

| | |
|---|---|
| **Dimensions** | 21" x 13" x 11" |
| **Net Weight** | 60 lb (27kg) |
| **Motor** | 1/20 HP |
| **Wheel Diameter** | 8" |
| **Electrical** | 90-120VAC; 5-/60Hz or<br>200-240 VAC, 50/60Hz |

### Accessories and Spare Parts

| Cat. No. | Description | Qty. |
|---|---|---|
| **50122-14** | Workstation Post | |
| **50122-15** | 8" Dia Glass Plate (must mounted to 50122-16, which is included with the Model 910) | each |
| **50122-16** | 8" Dia Aluminum Lapping Plate | each |
| **50122-17** | 8" Dia Cast Iron Lapping Plate | each |
| **50122-18** | 8" Dia Cast Iron Lapping Plate, Concentric Grooves | each |
| **50122-19** | 8" Dia Cast Iron Lapping Plate, Spiral Grooves | each |
| **50122-24** | 8" Dia Cast Iron Lapping Plate, Radical Grooves | each |
| **50122-25** | Cast Iron Conditioning Ring (for use with cast iron plate only) | each |

| Cat. No. | Description | Qty. |
|---|---|---|
| **50122-26** | 8" Dia Copper Composite Lapping Plate | each |
| **50122-27** | Diamond Conditioning Ring (for use with copper composite plate only) | each |
| **50122-40** | Manual Yoke, Left side (includes post #01-02262-01) | each |
| **50122-41** | Manual Yoke, right side (include post #01-02262-01) | each |
| **50122-42** | Lapping Plate Flatness measuring kit (includes:granite leveling plate and flatness gauge #02-02134-01) | each |



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## Model 920 - Lapping and Polishing Machine

The model 920 is the first in a new generation of multi-purpose lapping machines designed for accurately lapping and polishing a wide range of materials. The 920 can be used as a standard metallurgical grinder/polisher utilizing abrasive papers, abrasive films, diamond discs, polishing cloths, etc., or it can be used as a high precision free abrasive lapping machine for flat polishing of optical and semiconductor materials.

When used as a free abrasive lapping machine, the 920 can accommodate most of our Lapping Fixtures for precise sample orientation and maximum flatness. The precision fixtures and the self turning lap ensure samples of the highest quality. In addition to flat lapping, we offer 2 fixtures for polishing oriented crystals. The crystals can be oriented and subsequently polished while maintaining their orientation.

The Model 920 is also available with two optional workstations. These independently controlled workstations rotate polishing fixtures automatically, thereby simplifying the polishing process and minimizing operator supervision. The 920 is ideal for high precision polishing in both R & D and production environments.

## FEATURES

- Variable Speed, 10 - 600 RPM
- Solid, Cast Aluminum Construction
- Quick exchange of worn-out disc
- Stylish, Tabletop design
- Optional workstations for semi-automatic polishing
- Vibration free, quiet operation

## ORDERING INFORMATION

**Model 920 includes:** Model 920 is pre-wired for two workstation accessories and includes a water and a slurry deliver system. The aluminum plate #50122-16 (include 50122-30 O-ring for metal holding band). Metal holding band #50122-31 (for holding abrasive papers and polishing cloths). Glass plate #50122-15 (for use with abrasive film). Dust cover

| | | |
|---|---|---|
| **50124-20R** | Lapping and Polishing Machine Model 920 | each |

**Model 920L includes:** Model 920 Lapping and Polishing Machine, Standard Motorized Yoke Assembly, Right Side (Model 92034L), Drive Motor Assembly, Right Side (Model 92012R)

| | | |
|---|---|---|
| **50124-20L** | Lapping and Polishing Machine Model 920L | each |

**Model 920LR includes:** Model 920 Lapping and Polishing Machine, Standard Motorized Yoke Assembly, Left Side, (Model 92034L), Drive Motor Assembly, Left Side (Model 92012L), Standard Motorized Yoke Assembly, Right Side, (Model 92034R), Drive Motor Assembly, Right Side, (Model 92012R)

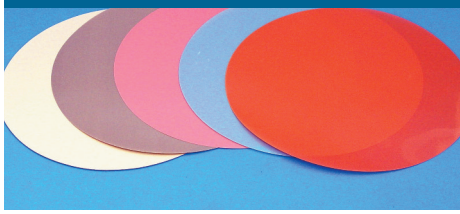
| | | |
|---|---|---|
| **50124-20LR** | Lapping and Polishing Machine Model 920LR | each |

### Accessories and Spare Parts

| Cat. No. | Description | Qty. |
|---|---|---|
| **50124-50** | Standard yoke assembly, left side, used with Model 92012L | each |
| **50124-51** | Standard Motorized post Assembly, Left Side | each |
| **50124-52** | Standard yoke assembly, right side, used with Model 92012R | each |
| **50124-53** | Standard drive motor post assembly, right side | each |
| **50124-54** | Yoke sweep mechanism, with motor drive, left side | each |
| **50124-55** | Yoke sweep mechanism, with motor drive, right side | each |
| **50124-56** | Digital RPM meter | each |
| **50122-42** | Lapping plate flatness measuring kit | each |
| **50124-14** | Tri-holder specimen mount (for metallographic mounts up to 38mm diameter | each |
| **50124-15** | Quad-holder specimen mount (for metallographic mounts 25-32mm diameter | each |
| **50122-15** | Glass Lapping plate, 8" | each |
| **50122-16** | Aluminum lapping plate, 8" | each |
| **50122-17** | Cast iron lapping plate, 8" | each |
| **50122-18** | Cast iron lapping plate, concentric grooves, 8" | each |
| **50122-19** | Cast iron lapping plate, spiral grooves, 8" | each |
| **50122-25** | Cast iron conditioning ring (for use with cast iron lapping plates only) | each |
| **50122-26** | Copper composite lapping plate, 8" | each |
| **50122-27** | Diamond conditioning ring (for use with copper composite lapping plate only) | each |

## RELATED PRODUCTS...

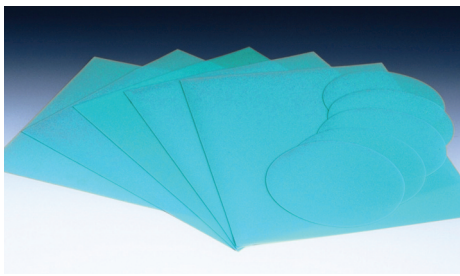
Lapping and Polishing Supplies



### Diamond Lapping Film

A selective diamond particle resin bonded to a uniform 3-mil polyester film backing. Excellent for polishing samples with differing hardness.

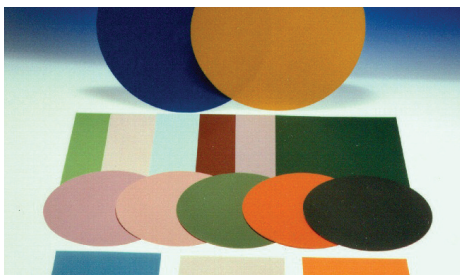
**See page 15.**



### Final Finishing Film

All films are 8" diameter, and available with either plain back (P/B) or pressure sensitive adhesive (PSA)

**See page 15.**



### Aluminum Oxide Abrasive Film Discs

Our Aluminum Oxide Abrasive films with a PSA back or a plain back are ready to use in all sample polishing applications.

**See page 15.**

# ULTRAPOL Advance – Flat Lapping and Polishing Machine

## PRODUCT HIGHLIGHTS

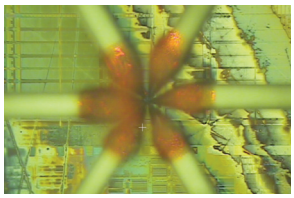
- **Better delayering results - The ULTRACOLLIMATOR option allows for improved parallelism, improving the 'sweet spot' of the delayered surface**
- **Fast & repeatable alignment - precise 2-circle tilt-adjust, coupled with high quality linear bearings in the Z-axis provide for optical alignment that does not wander.**
- **Slurry polishing - A recirculating pump may be added, in addition to the standard coolant system. Slurries are held within a drip tray for easy disposal, or re-use.**
- **Avoids cross-contamination - The unique slurry / drip tray concept allows convenient removal and cleaning of all items that come into contact with abrasives and polishing media**

ULTRAPOL Advance has been designed to be an all-in-one lapping & polishing workstation for the production of flat surfaces. Advance's unbeatable combination of advanced control and process features allow for the accurate processing of modern generations of IC's.

Key applications of the technology include:

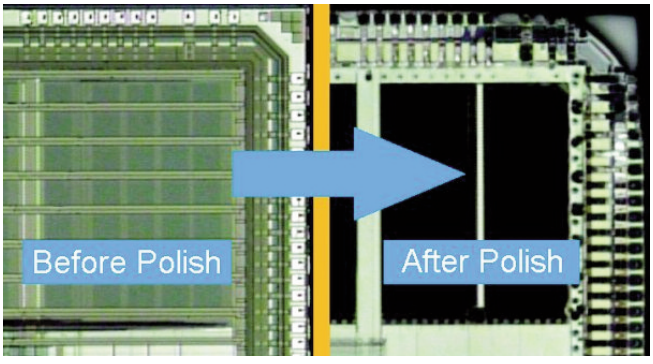
- *Topside electronic de-processing - enabled by the advanced angular control and optical enhancements such as ULTRACOLLIMATOR.*
- *Backside preparation of packages and wafers, particularly for flip-chips - and rapid global thinning of larger surfaces.*
- *Cross-sectioning of die and package-level devices.*

Along with ULTRA TEC's signature Quick Release interface and workholder technologies, ULTRAPOL Advance offers completely new designs for sample loading, oscillation and tilt alignment.



Fast and convenient sample movement between polisher & microscope, coupled with the option of the ULTRACOLLIMATOR optical alignment system, provides reference to the die -- a huge improvement over earlier generation polishers.

The system allows recirculating slurry polishing (key for many delayering operations) as well as standard faucet coolant. For aggressive material removal operations (such as the back-thinning of larger flip chips), a 'Power polish' mode is incorporated that rotates the sample during processing.



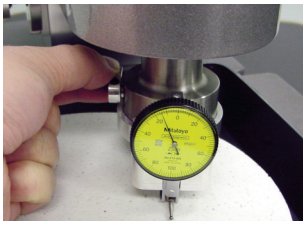

*Planar polishing with extremely low edge-rounding*


ULTRAPOL Advance with ULTRACOLLIMATOR.
Left: Start-Up Accessory Kit

## FEATURES

### Intuitive design & optimized ergonomics

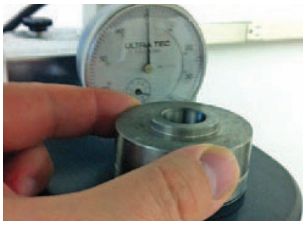
ULTRAPOL Advance incorporates key improvements in the control of all polishing parameters, sample mounting, sample transfer, and calibration.



Mechanical Alignment for Lower-Spec Applications

Convenient Cleaning with Removable Slurry Tray

Fine Adjust of Sample Load



Coarse Adjust of Sample Load

'Easy Lift' Polishing Head

'Quick Release' Sample Interface



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## ULTRAPOL Advance (continued)

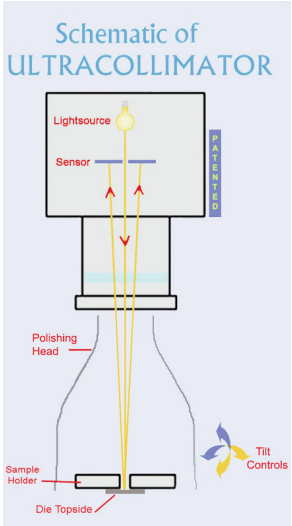
### ULTRACOLLIMATOR


*Faster, more accurate alignment for better polishing results*

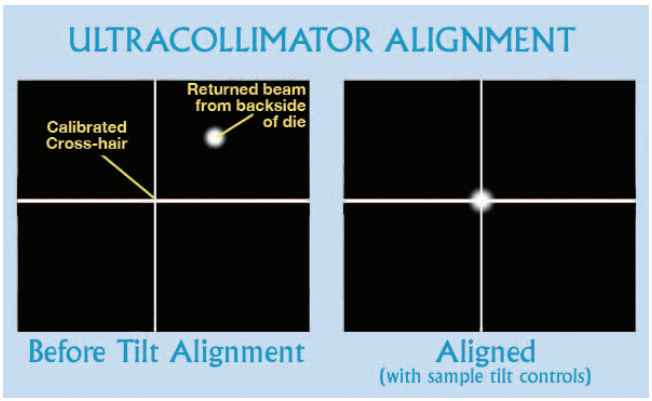
- **Works in conjunction with tilt controls to control sample alignment**
- **Improves alignment accuracy up to 20X**
- **Suits topside & backside electronic sample polishing**
- **Suits requirements for double sided polishing**

Our patented ULTRACOLLIMATOR technology allows for fast accurate and repeatable parallel alignment of surfaces to the polisher. Since the collimator beam optically aligns directly to the die, there is no guesswork or the need to use mechanical indicators. Alignment is constantly monitored during polishing. Transfer to-and-from the microscope is made fast and accurate. Any small realignments can be made quickly and accurately.

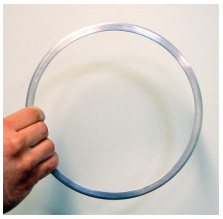
ULTRACOLLIMATOR modules allow the user to produce the finest results of sample parallelism with both flat lapping and selected area preparation machines. The units produce a 'single box' solution, incorporating an lcd screen and all the controls required to align the sample.




The use of optical alignment allows for simpler faster and significantly more accurate alignment to be achieved on a range of sample types and applications including: Crystal polishing, Double side wafer polishing, Topside de-processing of layers of metal circuitry for electronic failure analysis and competitive analyses, Backside polishing of packaged computer dice for 'through silicon' microscopy.

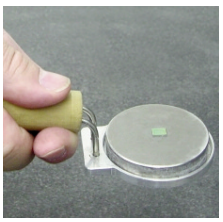



## ACCESSORIES



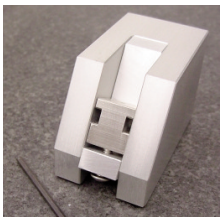
### Disc Holding Band

Our Disc Holding band works with ULTRAPOL 8" machines and many other 8" machines on the market. It holds down the lapping film or surface and can also stop splash.



### Hotplate Transfer Device

The Hotplate Transfer Device makes transfer of hot samples convenient and safe. The sample holder is placed on the device and then plated on the hotplate for heating and cementing with Crystal Wax or similar adhesives. After mounting, the device is then moved to the cooling platform.



### Mounting Stand for SEM Stubs

The SEM Stub Mounting Stand holds the SEM stub during hot mounting (on a hotplate) at a convenient angle and height for cross-sectional single dice be mounted correctly.

## ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **3250.1** | ULTRAPOL Advance Polishing system | each |
| Includes Base unit with timer, oscillator, speed control (50 to 400rpm), 8" (200mm) Polishing plate Sample Z-direction control with 1µm precision Mechanical alignment indicator 2 circle tilt control (+/- 2 degrees) Sample Rotation control Quick release interface mounting system 2 sample mounting plates and start-up accessory kit Sample Load Control – 0 to 3 kg (in 50 gram increments) Drip Tray / Slurry Containment Tray | | |
| **6183.UL** | ULTRACOLLLIMATOR Laser Alignment upgrade, | each |
| Includes main unit, incorporating laser module, cross-hair generator, and 6.5 inch LCD monitor, with Video Out (ntsc). Includes optical flat and mounting bracket for ULTRAPOL advance | | |

### Accessories

| | |
|---|---|
| **6189.1** | Hotplate Transfer Device |
| **6178.1** | Mounting Stand for SEM Stubs |
| **1503.1** | Disc Holding Band |

### Workholders

**Standard Mounting Plates**

| | |
|---|---|
| **6170.1** | Standard Mounting Plate - 1mm Alignment Hole |
| **6170.2** | Standard Mounting Plate - 2mm Alignment Hole |

**Cross-Section Holders**

| | |
|---|---|
| **6124.1** | Encapsulated Mount Fixture – Holds 0.5 inch to 1.5 inch diameter mounts |
| **6150.1** | Quick Release Vise for holding packages, large dice, waveguides etc. |
| **6145.1** | Single Die Stub Cross-section holder |

**SEM & FIB Stub Polishing Holders**

| Cat. No. | Style | Cat. No. | Style |
|---|---|---|---|
| **6172.H** | Hitachi | **6175.H** | Hitachi, stub only |
| **6172.J** | JEOL | **6175.J** | JEOL, stub only |
| **6172.Z** | Zeiss | **6175.Z** | Zeiss, stub only |
| **6172.F** | FEI | **6175.F** | FEI, stub only |
| **6172.P** | Philips | **6175.P** | Philips, stub only |

## ULTRAPOL End & Edge Polisher

*Flat and angled preparation of optical and electronic components*


### PRODUCT HIGHLIGHTS

- **Fully Angle adjustable Quick Release Interface allow for fast and repeatable mounting and demounting.**
- **Holders available for most components**
- **Fast process times**
- **Low run-out lap for flat optical polishes**

ULTRAPOL End & Edge Polisher has been designed to provide accurate lapping and polishing for most research and industrial applications.

Key to the high quality performance of the unit is the calibration of the polishing base and the advanced angular control provided by the polishing head.

Built-in features such as tachometer, process end-indicator, timer, and head oscillation provide assurance the finest surface production.

The specific workholder for an application is held firmly and repeatably with the system's quick release interface. Standard holders are available for most applications, including:

**Capillary / glass ferrule polishing**
**Planar Waveguide polishing**
**Bare fiber polishing - flat and angle polishing**
**Integrated optics**
**Die Cross-sectioning**
**SEM and TEM sample preparation**
**IC Wafer and package-level backside preparation**
**Encapsulated mount polishing**

Custom workholders can also be designed to your specific needs.

ULTRAPOL End & Edge Polisher uses 8 inch diameter diamond lapping films which are easily changed for maximized output.


### SPECIFICATIONS

| | |
|---|---|
| **Angular Accuracy** | 0.1 degrees |
| **Angular Range** | 0 to 12 degrees |
| **Footprint** | 22 inches (55 cm) wide<br>x 12 inches (30 cm) deep<br>x 19 Inches (48 cm) high |
| **System Weight** | 27 kg (60 lbs) |

### ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **6390.1** | ULTRAPOL End & Edge Polishing System<br>Configured for 100-220/240V. Includes advanced base unit with timer, tachometer, solenoid coolant system, speed control and process-end indicator. Micropositioner head includes, advanced angular control, low inertial mass loading system with auxiliary weight kit, oscillation control, 1 micron Z-control and "Quick Release" workholder mounting system. | each |

#### Accessories

| | | |
|---|---|---|
| **2239.1** | 8" (200mm) anodized lapping plate | |
| **1301.5** | Lamp | |
| **1503.1** | Disc Holding Band | |

#### Workholders

| | | |
|---|---|---|
| **4079.1** | Thin plate edge polishing holder – holds plates up to 2.5cm long | each |
| **4079.2** | Thin plate edge polishing holder – holds plates up to 5cm long | each |
| **2707.1** | Bare fiber holder (with 125 micron replaceable ferrule) – 1 position | each |
| **2707.4** | Bare fiber holder (with 125 micron replaceable ferrule) – 4 positions | each |
| **2745.1** | Bare fiber holder – holds 5-8 fibers – for fibers > 400 micron (specify fiber size when ordering) | each |
| **3552.1** | Saddle Clamp – holds endoscopes, glass rods etc | each |
| **3547.1** | V-clamp – holds large fiber bundles and rods (16mm to 34mm diameter) | each |
| **2727.1** | Capillary / glass ferrule workholder (1.25 to 2.5mm diameter) – 12 positions | each |
| **2726.1** | Capillary setting stand – works with 2727.1 | each |
| **2024.1** | Encapsulated mount workholer – (holds mounts 0.5 to 1.5 inch diameter) | each |
| **4065.1** | Single die edge x-section / SEM Stub holder | each |



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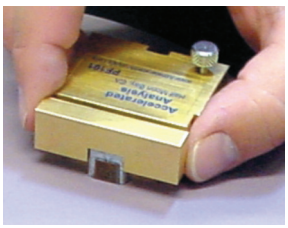
## ULTRAPOL Basic Manual Polisher

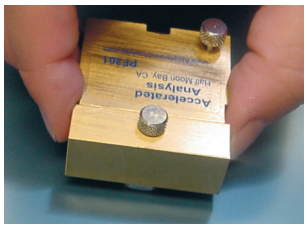
Manual polishing tools remain important to the lab needing good delayering and/or crosssectioning results on a very tight budget.


### Product Highlights

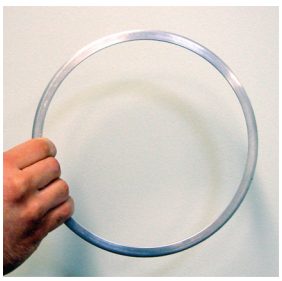
- Works with all 8" (200mm) surfaces
- Small footprint
- Speed Control and high torque motor
- Coolant speed control



UPF101 Accelerated Analysis Manual Cross Section Fixture



UPF201 Accelerated Analysis Manual Parallel Polish Fixture



### Disc Holding Band

Our Disc Holding band works with ULTRAPOL 8" machines and many other 8" machines on the market. It holds down the lapping film or surface and can also stop splash.

| Cat No. | Description | Qty |
|---|---|---|
| **1209.1** | ULTRAPOL Basic Polisher | each |
| Configured for 100-220/240V operation. 0-500 RPM. Includes 8 inch (200mm) polishing system with speed control and solenoid-controlled coolant system | | |
| **UPF101** | Accelerated Analysis Manual Cross Section Fixture | each |
| Includes 5 aluminum and 5 stainless steel sample mounts | | |
| **UPF201** | Accelerated Analysis Manual Parallel Polish Fixture | each |
| Includes alignment mirror and 3 parallel polish sample mounts. | | |
| **1503.1** | Disc Holding Band | each |
| **2239.1** | ULTRAPOL Spare 8 " (200mm) anodized aluminum plate | each |

## UltraPol Manual Polishing Station

For quick, simple hand lapping applications, the manual lapping station has a smooth 8" glass surface to support precision lapping films. The fluid containment tray underneath the plate collects water run-off from the lapping surface for later disposal, keeping the polishing process area clean and contained. A Plexiglas lid protects the lapping surface when not in use and is an ideal, safe place to store lapping films flat. The manual station is ideal for short hand polishing processes and includes the glass plate and protective cover.

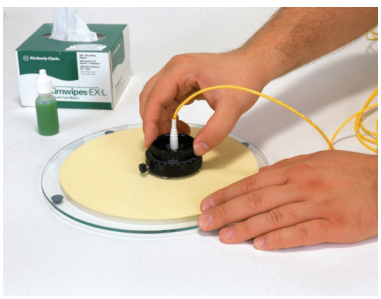
| Cat No. | Description | Qty |
|---|---|---|
| **1201.1** | ULTRAPOL Manual Polishing Station | each |
| includes fluid containment tray and 8 inch (203mm) aluminum polishing surface. Can be used with films, pads or glass surfaces. | | |
| **1228.1** | Plexiglass Lid for ULTRAPOL Manual Polishing Systems | each |
| Keeps films, fluids and sufaces safe and maintains moisture overnight | | |

## Ultratool Manual Polishing Tool

ULTRATOOL was designed for manual polishing of fibers, either supported (connectorized) or nonsupported (bare fibers), The tool uses various replaceable modules which are available for all types of connectors -- if needed, custom modules can be designed and manufactured by ULTRA TEC.

Key to ULTRATOOL's performance is a height adjust feature that is controlled by a fine pitch micrometer screw thread.

Flat, PC & APC polishes can be performed on all standard connector types. Another common use is bare-fiber polishing applications (flat and angled). ULTRATOOL is capable of holding bare fibers of the full size range and many other materials such as small wafer sections (for planar or edge polishes).



| Cat No. | Description | Qty |
|---|---|---|
| **1101.6** | ULTRATOOLKIT | each |
| package includes 1101.1 tool in carrying case with: 8x spare wear stops, 4 connector inserts (for ST, FC, SC and LC), locking tool, 1 oz bottle of ULTRAPOL B suspension | | each |
| **2240.1** | Glass lapping plate, for manual polishing | each |
| **1101.1** | ULTRATOOL spare manual tool | each |

# INSTRUMENTATION

## FIBERTEC Mass Production Fiber Polisher

- **LCD screen for storing up to nine different polishing recipes and process information**
- **Platen torque remains fixed even when speed is varied**
- **Air and water are kept separated inside of housing to ensure safe operation**
- **Adjustable weight allows for proper polishing force**
- **Anti-vibration feet allow for precise leveling - more consistent results**

Electron Microscopy Sciences is proud to introduce a new mass-production connector polisher. FIBERTEC can polish between 10 and 24 connectors at a time.

Industry-standard polishes are readily achieved due to a robust design and system build along with using the latest techniques.

The system's LCD screen makes process control and great connector polishing results easier than ever to achieve. Pressure and platen speed are controlled for ultimate consistency and performance.

*Recipe and process conditions can be saved.*

*System has a handy station for resting connector holder during film changes.*

### SPECIFICATIONS

| | |
|---|---|
| **Footprint** | 220mm Wide x 420mm |
| **Net Weight** | 26Kg |
| **Power** | 110VAC 60Hz or 220VAC 50Hz - 85w |
| **Air Consumption** | 3 kgf/cm (squared) |
| **Polishing Disk OD** | 112mm (accepts 5 inch dia. polishing film) |
| **Polishing Plate Speed** | 30 – 300 RPM |
| **Timer** | 1 to 999 seconds |

### ORDERING INFORMATION

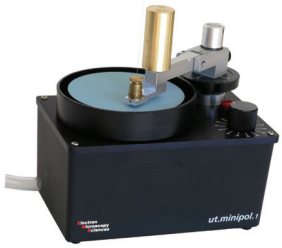
| Cat No. | Description | Qty |
|---|---|---|
| **9812.1** | FIBERTEC Polisher (110V version) | each |
| | Includes advanced programmable fiber connector polishing system with 5 resilient polishing platens. | |
| **9812.2** | FIBERTEC Polisher (220-240V version) | each |
| | Includes advanced programmable fiber connector polishing system with 5 resilient polishing platens. | |

| Cat No. | Description | Qty |
|---|---|---|
| **Connector Holders** | | |
| **9804.1** | ST Holder (12 positions) | each |
| **9805.1** | SC Holder (12 positions) | each |
| **9805.16** | SC Holder (16 positions) | each |
| **9805.8** | SC APC Holder (12 positions) | each |
| **9814.1** | FC Holder (12 positions) | each |
| **9814.8** | FC APC Holder (10 positions) | each |
| **9815.1** | LC Holder (16 positions) | each |
| **9815.1L2** | LC2 Holder (16 positions) | each |
| **9813.1** | MU Holder (18 positions) | each |
| **9815.8** | LC APC Holder (12 positions) | each |

## UT.Minipol.1 Polisher Single Position Fiber Polisher

*Fiber polisher for small volume terminations*

- **Retro-polishing - Bring already-installed connectors up to current industry requirements**
- **Wide range of holders**
- **Low Cost machinery solution**




UT.MINIPOL.1 provides many of the features of larger polishing units in a small benchtop package—perfect for users with small production batches, or operating with a limited budget.

**Versatility —** All connector types may be prepared by the system, including SC, FC, ST, D4, SMA, bare fibers, PC, and Flat polishes are all accommodated by simple changes of the lap and/or the workholder.

**Unique Features —** A factory-set reciprocating arm movement rides the rotating lap producing high performance. This produces quality results at a low price.

**Scope Of Use —** UT.MINIPOL.1 allows for use as a retropolishing machine or as a quick factory-use system whether used singly, or in tandem with other units.

**Accessories —** The system can be powered by 110 or 220 VAC converter or by a standard 12V battery. A wide variety of Workholders are available for extending the use of the system at any time.

**Tools And Consumables —** ULTRA TEC stocks a wide range of Polishing Films, Papers, Pads and accessories for all polishing applications.

### SPECIFICATIONS

| | |
|---|---|
| **Lap Diameter** | 4 inch (100mm) |
| **Weight** | 2.2kg (5 lbs.) |
| **Power Supply** | 12V Converter |
| **Timer** | 10-120 Seconds |

### ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **8801.1** | UT.Minipol.1 Polisher | each |
| **Accessories** | | |
| **4026.1** | 220VAC Adapter | each |
| **6594.1** | Hard Surface Disc | each |
| **6593.1** | Resilient Surface Disc | each |
| **4030.1** | Carrying Case | each |
| **4027.1** | Battery and Charger | each |



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## ULTRAPOL Fiber Lensing Machine

*The world's first dedicated mechanical fiber lensing system*

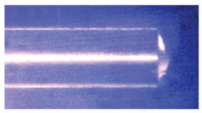
- **Unsurpassed concentricity – singlemode compatible**
- **Advanced angle control ensures optimum success rate**
- **Fiber lens shapes of many types and angles**
- **Uses 5 inch lapping film – low consumable costs**


ULTRAPOL Sculpted end polisher offers the fiber optic communications industry the ability to produce accurate end profiles on bare optical fibers. Improved design of fiber holding, and all processing characteristics, provide concentricity of a couple of microns. This means that accurate bisecting of a singlemode (9micron) fiber core can be achieved. Full angular control is achieved with the advanced positioning features of the integral micropositioned polishing head. This makes possible the production of the fiber lens shapes shown below. The system uses a 5 inch diameter polishing lap – a size specially chosen for improved flatness/run-out and lower consumables costs.

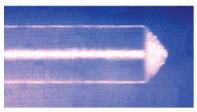
### SPECIFICATIONS

| | |
|---|---|
| **Angular Accuracy** | 0.1 degrees |
| **Included Angle Range** | 20 to 180 degrees |
| **Footprint** | 22 inches (55 cm) wide x 12 inches (30 cm) deep x 19 Inches (48 cm) high |
| **Unit Weight** | 27 kg (60 lbs) |
| **Voltage** | 110 V / 60Hz and 220 to 240V, 50 Hz |

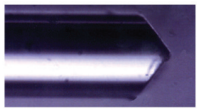
### SCULPTED END EXAMPLES



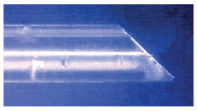
Large included-angle tapers



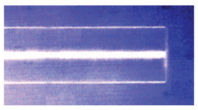
Small included-angle tapers



Chisel/screwdriver



Bevels



Flat Ends

### ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **6380.1** | ULTRAPOL Fiber Lensing Machine | each |
| | Includes: ULTRAPOL Base unit with 5" o.d lapping plate, Fiber Lensing Micropositioner, with feed through spindle. Produces sculpted ends on optical fibers – examples: cone tips, chisel / screwdriver tips, bevels. Power: 110V/60Hz and 220 to 240V, 50 Hz | |
| **4023.1** | 5" (12.5 cm) spare polishing plate | each |
| **1871.1** | Set of 3, 125 micron replaceable ferrules | each |
| **1325.1** | Sapphire cleaving tool | each |
| **1812.1** | 125 micron fiber spindle module | each |
| **1814.1** | 140 micron fiber spindle module | each |
| **1804.1** | 400 micron fiber spindle module | each |
| **1860.1** | 600 micron fiber spindle module | each |
| **M.5438.1** | 30 micron diamond, 5 inch, plain-backed film (15 pcs) | each |
| **M.5436.1** | 15 micron diamond, 5 inch, plain-backed film (15 pcs) | each |
| **M.5437.1** | 6 micron diamond, 5 inch, plain-backed film (15 pcs) | each |
| **M.5433.1** | 3 micron diamond, 5 inch, plain-backed film (15 pcs) | each |
| **M.5432.1** | 1 micron diamond, 5 inch, plain-backed film (15 pcs) | each |
| **M.5450.1** | ULTRAFILM B, 5 inch, plain-backed film (100 pcs) | each |

## NANOpol Bare Fiber Beveling System

NANOpol offers the fiber optic communications industry the ability to produce accurate polished bevels on bare optical fibers.

Angular control is achieved with the advanced positioning features of the integral micropositioned polishing head.

Designed for the price-conscious university and research environments, NANOpol uses a 4 inch diameter polishing lap – a size specially chosen for improved flatness/run-out and low consumables costs.


### ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **8801.BF** | NANOpol Fiber Polishing Machine | each |
| | Includes: NANOPOL Base unit with 4" o.d lapping plate, Fiber Polishing Micropositioner Produces bevels and flat polishes. Power: 110 V / 60Hz and 220 to 240V, 50 Hz | |

#### Accessories

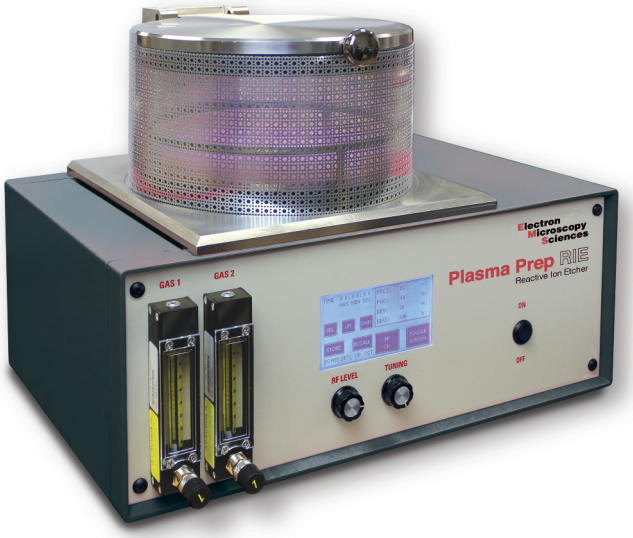
| | | |
|---|---|---|
| **1851.01** | Lensing Module Add-on BF Ball Tip | each |
| **1851.07** | Lensing Module Add-on BF Single Flat Tip | each |
| **8010.01** | 4" Aluminum Carrier Plate | each |
| **8010.02** | 4" Resilient Carrier Plate | each |
| **8010.03** | Weight Kit | each |
| **1535.01** | Quick-Release Mount | each |
| **2358.01** | Ferrule Forming Lap | each |
| **8010.05** | Ferrule Clearing Wire | each |
| **4444.04** | 4" Bare-fiber Polishing Film Package | each |

#### QR Holders

| | | |
|---|---|---|
| **2703.1** | SMA 905 ,One Position Connector Holder | each |
| **2703.6** | SMA 906,One Position Connector Holder | each |
| **2707.XXX** | Bare fiber holder, One Position - Specify O.D. of Stripped Fiber | each |

# Reactive Ion Etcher – Model RIE 2000

The Reactive Ion Etcher (RIE) is a table-top plasma chemistry reactor designed to provide anisotropic etch plasma technology at a moderate cost. This simple-to-operate instrument can perform repeatable plasma chemical reactions with a minimum of automation. All controls are manually entered into and monitored by a touch-screen interfaced control system which is equipped with automatic monitors and interlock controls to protect the equipment and the samples in the reactor. The RIE requires cooling of the stage. A simple water recirculator is typically sufficient for this task. A small water chiller option is also available for this system. Vacuum is supplied by an integrated turbo pump.




## Introduction to Anisotropic Etching

Wet etching of samples is not only dangerous, in many cases it causes undercutting due to the isotropy of the etch. The Reactive Ion Etcher (RIE) uses dry etching to create an anisotropic etch - meaning that the etch is uni-directional. For laboratory applications, the typical plasma etcher has a "barrel" design, or in other words, a cylindrical or barrel geometry to the reaction chamber. One feature of this design is that any point on the surface to be etched can be approached with equal probability from all directions, leading to an etch that is described as being "isotropic". For most if not many applications generally, an isotropic design is probably the design of choice. But in some instances, such as the removal of a passivization layer from an electronic device, isotropic etching always results in undercutting, and when the lines are below a certain point in width, such processing completely undercuts the lines leading to the layers literally falling off. But because for a "barrel" design, one can achieve respectable etch rates at relatively low power, the systems can be built and sold at lower prices.

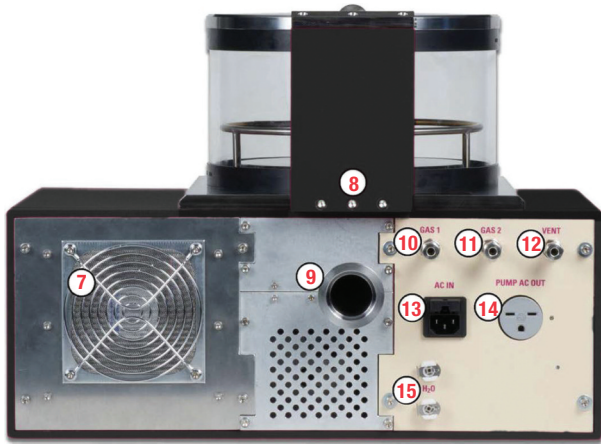

1. Gas 1 Flow Meter/Control
2. Gas 2 Flow Meter/Control
3. LCD Screen
4. RF Level Control
5. Tuning Control
6. Main Power ON/OFF

## TYPICAL APPLICATIONS

- Final package removal
- Glass passivation layer removal
- Deep etching
- Removal of contaminants

## FEATURES

- Table top design
- LED touch screen for ease of use
- Small footprint: 15" L X 21" W X14" H
- 13.56 MHz RF Plasma
- 110/240VAC, 50/60Hz
- 10 to 200 Watts continuous power
- Dual gas input
- Manual gas and pressure control
- Process timer for reproducible runs
- Shielded Quartz chamber
- Chamber size 10", 8" sample stage
- Works with $O_2$, $CF_4$, Ar and other gasses
- Complete with Turbo System and controller
- 75 lbs




7. NW40 Vacuum Outlet
8. Hinge Bracket
9. RF Deck Cooling Fan
10. Gas 1 Line Input
11. Gas 2 Line Input
12. Chamber Vent Line Input
13. AC Power In (220V)
14. Pump outlet (220V)
15. Water Lines In/Out



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## Reactive Ion Etcher – Model RIE 2000 (continued)

### System Includes

**Reactive Ion Etcher** **Quartz Chamber** **Vacuum hose**

The system does include a simple water circulator. We would recommend that a small water chiller be used which will provide a reliable flow of cool water.

**Note:** Item 55320 has been replaced by items 55320-01, 55320-02, 55320-03 and 55320-04.

### Solid State Cooling Systems Chiller

The UC170 Chiller by Solid State Cooling Systems will give precise temperature control and respond instantly to any load changes holding to ± 0.1°C, even near ambient temperature. It is highly energy efficient, only using power as needed. This unit will fit with ease on your tabletop or inside your equipment, as it is the world's smallest air-cooled recirculating chiller.

### UC170 SPECIFICATIONS

| | |
|---|---|
| **Operating Range** | 2°C to 45°C (160W/180W models), 10°C to 45°C (170W/190W models) |
| **Ambient Temperature** | 10°C to 40°C non-condensing |
| **Repeatability** | ± 0.1°C (even near ambient) |
| **Cooling Capacity** | 160W to 190W @ 20°C (20°C ambient) |
| **Noise (at 1 meter)** | <63 dBA |
| **Coolant/Process Fluid** | Koolance (27% propylene glycol/water mix) or 27-50% ethylene glycol/water mix |
| **Process Fluid Fittings** | ⅛" female CPC with shut-off valve |
| **Pump** | Magnetically-coupled gear pump with brushless DC motor |
| **Tank Volume** | 75 ml with level sensor (optional sealable cap) |
| **Wetted Materials** | Al and polymers, or Cu and polymers |
| **Size (L x W x H)** | 7.5 x 5 x 7" (19 x 13 x 18 cm) |
| **Weight** | 8 lbs (3.5 kg) |
| **Power Input** | Universal: 100 - 240 VAC, 50/60 Hz, 2.8A max |
| **Power Consumption** | Less than 200 Watts |
| **Operating Voltage** | 13.5 VDC, 15 amps max (universal input, laptop style power supply included) |
| **Communications** | Keypad or RS232 interface |
| **Alarms** | Temperature, fluid level, component or system failure (display, RS232 and dry contact) |

### ORDERING INFORMATION

| Cat No. | Description | Qty |
|---|---|---|
| **55320-01** | Reactive Ion Etcher- Model RIE 2000 110 Volt (no pump, no recirculator) | each |
| **55320-02** | Reactive Ion Etcher- Model RIE 2000 220 Volt (no pump, no recirculator) | each |
| **55320-03** | Reactive Ion Etcher- Model RIE 2000 110 Volt with Turbo Pump (no recirculator) | each |
| **55320-04** | Reactive Ion Etcher- Model RIE 2000 220 Volt with Turbo Pump (no recirculator) | each |
| **55320-05** | Solid State Cooling Systems Chiller | each |

## RELATED PRODUCTS...

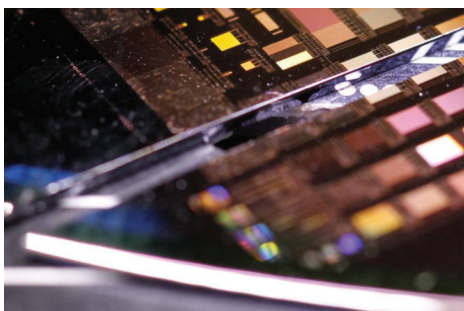
Cleaving & Scribing Systems And Tools


### NEW! LatticeAx™ 225

*Accurate Indent and Cleaving System*

The addition of high magnification imaging enables accurate indenting, resulting in samples cleaved with high accuracy. The LatticeAx™ 225 delivers 20µm accuracy with high quality cleaved surfaces in 5 min. It integrates the patent pending LatticeAx™ base with an industrial platform customized for indenting and cleaving..

**See pages 120–123.**



# MicroCleave™ Kit - Model 520

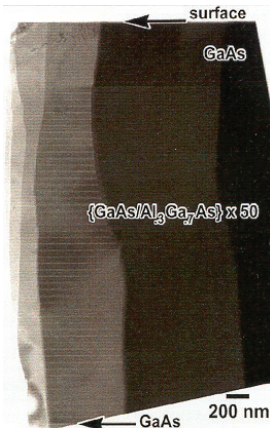
The MicroCleave™ technique is a relatively simple and inexpensive method of producing superior cross sectional TEM specimens. For speed in preparation, it is unsurpassed.

One limitation of the technique is that it does require the substrate material to be cleaved or fractured. For this reason, it has been applied almost exclusively to semiconductor materials. Recently, the technique has been extended to other substrates, such as glass, silicon carbide, quartz, sapphire, and other hard materials. It is particularly well suited for rapidly examining coatings and thin films very soon after they are deposited.

## FEATURES

- **Relatively simple and inexpensive method for the preparation of TEM cross sections, where specific information is not required.**
- **Ideal when sample availability is limited as it requires very little starting material.**
- **While originally designed for semiconductors, the technique has been applied to glass, silicon carbide, quartz, sapphire, and other brittle materials.**
- **No ion milling is required. Therefore, no amorphization, no heating effects, no ion implantation, and no preferential sputtering.**
- **The MicroCleave™ sample is ideally suited for rapid crystallographic orientation and determination in the TEM**
- **The MicroCleave™ technique is fast and typically requires preparation times of less than 1 hour. This makes it particularly well suited for rapid examination of coatings and thin films shortly after deposition.**


An X-ray mirror consisting of 45 layers of alternating Mo/Amorphous Si (7.0 nm period) on Si substance. Image courtesy of John McCaffrey – National Research Council of Canada




Multiple Quantum Well structure grown by MBE showing the thickness terraces possible with a MicroCleave™ sample. Courtesy of Scott Walk – Materials Directorate WPAFB. (Now with PPG Industries)

**References:**

1. Ultramicroscopy, 38 (1991) 149, John P. McCaffrey.
2. TEM Samples of semiconductors Prepared by a Small-Angle Cleavage Technique, J.P. McAffrey, Materials Research Society, Vol. 254 (1992).
3. Microscopy Research and Technique, 24 91993) 180, j. p. McCaffrey.
4. A simplified Method for Modifying TEM Copper Grids for Use with Small Angle Cleavage Technique, Microscopy Today (96-4) (1996, Scott D. Walck.
5. The Small Angle Cleavage Technique: An Update, Scott D. Walck and John McCaffrey. Materials Research Society, Vol. 480 (1997).

## ORDERING INFORMATION

| | | |
|---|---|---|
| **50130-20** | Model 520 MicroCleave™ | Complete Kit |

**Complete Kit includes:**

| Product # | Description | Qty |
|---|---|---|
| **50130-50** | Model 150MC Lapping Fixture | each |
| **50130-51** | #5201 Grid Bending Jig with Cover | each |
| **50130-52** | Engraved Mounting Block for 150MC | 3/pk |
| **50130-53** | PTFE Block, 1x1x0.50" | 5/pk |
| **50130-54** | Post-it Block | each |
| **50130-55** | Lantern Slide | each |
| **50162.80** | Model 180 Lapping Tray | each |
| **50162-81** | Angle Guide for Model 180 | each |
| **50130-56** | Silicone Mat | each |
| **70030** | Coarse Scribe | each |
| **62107-ST** | Micro Scribe | 15/pk |
| **50130-59** | Tab Grid (100/pk) | 5/pk |
| **71700** | Lens-Tissue | each |
| **50130-60** | Transparent Ruler | 5/pk |
| **60968** | Tri-pour Beaker with Lid, 50ml, 10/pk | each |
| **50130-61** | Petri Dish with Mounted Slide | each |
| **50130-62** | Petri Dish with lids | 5/pk |
| **71140** | 100-position Grid Storage Box | 5/pk |
| **50130-63** | Silver Epoxy | each |
| **66100-20** | Red Sable Brush, Size 2/0 | each |
| **50130-64** | Mixing Tray (Aluminum Dish), 10/pk | each |
| **72350** | Hot/Stirrer Plate | each |
| **50160-25** | Cooling Tray | each |
| **72703-D** | Tweezers #5, 45 Degree Bent | 5/pk |
| **50419-20** | Quick Stick - Mounting Wax | each |
| **50130-66** | Lint-Free Cloth, size 4 x 4", 10/pk | each |
| **50350-35** | Diamond Lapping Film, 30 micron | each |
| **50130-67** | Squeegee | each |

| | | |
|---|---|---|
| **50130-21** | Model 520-B - Basic MicroCleave™ | Kit |

**Basic Kit includes:**

| Product # | Description | Qty |
|---|---|---|
| **50130-50** | Lapping Fixture, Model 150MC | each |
| **50130-51** | #5201 Grid Bending Jig with Cover | each |
| **50130-52** | Engraved Mounting Block for 150MC | 3/pk |
| **50130-53** | PTFE Block | 5/pk |
| **50130-54** | Post-it Block | each |
| **50162-80** | Model 180 Lapping Tray | each |
| **50130-61** | Petri Dish with Mounted Slide | each |
| **50162-81** | Angle Guide for Model 180 | each |



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# EQUIPMENT & ACCESSORIES

**TENSILE STAGES,** RECIRCULATING HEATERS AND CHILLERS, **COOLING STAGES,** GLOW DISCHARGE SYSTEM, **SPUTTER COATERS/CARBON COATERS,** VACUUM EVAPORATORS (LARGE CHAMBER), **RF PLASMA ETCHERS/REACTORS,** CRYO-SEM PREPARATION SYSTEMS, **SPECIMEN TRANSFER SYSTEMS**

Electron Microscopy Sciences

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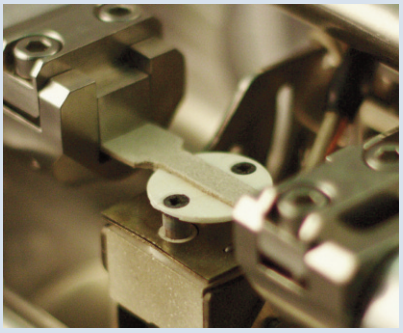
# EQUIPMENT & ACCESSORIES

## Tensile testing for today

Modern day Scanning Electron Microscopes can be very complex, especially when it comes to fitting a tensile stage. The vacuum chamber of an SEM is already a confined space, and there may be other instruments already installed which form additional obstacles. Swift Instruments have solved this problem by designing a flexible range of new tensile stages which address today's space constraints.



## SPECIFICATIONS

**The SWF 5000 and SWF L5000 have the following base specifications:**

| |
|---|
| Maximum Force of 200N, 5kN and 10kN |
| Tensile and Compression Testing |
| 3 and 4 point anvils for bend tests available |
| Fits samples sizes 54-68mm long, up to 9mm wide and 5mm thick. If a heater or chiller is used then sample size is dependent on stage type. |

*Swift Instrument Tensile Stages can be fully customized to meet your needs. The Swift Instruments team can offer a custom-designed service to suit even the most demanding vacuum chamber configurations.*

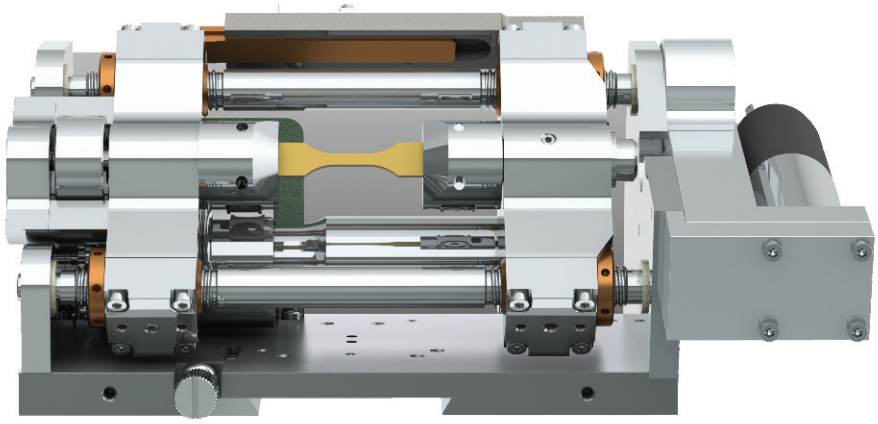
## ORDERING INFORMATION*

| Description | Qty. |
|---|---|
| SWF 5000 Tensile Stage | each |
| SWF L5000 Tensile Stage | each |

* Please contact us to discuss your particular requirements

*A new range of adaptable tensile and compression solutions for today's SEM*

## Swift Instruments SWF 5000 and SWF L5000 Tensile Stages



## Introducing the SWF 5000 and SWF L5000 Tensile Stages

Swift Instruments are proud to introduce the Swift SWF 5000 and SWF L5000 Tensile Stages. Providing an already comprehensive specifications, these Swift Tensile Stages can be fully customized to meet your exact requirements.

The Swift SWF 5000 provides a compact system for testing samples at both the flat position and EBSD 70° angle. The stage's rotating jaws eliminate the need to tilt or move the stage itself. This allows for both a space-saving form factor and greater setup efficiency and ease of use.

The Swift SWF L5000 is a low profile solution for tensile testing at both the flat position and EBSD 70° angle. This highly compact design is ideal for tensile testing when headroom is at its most limited.

### Computer-Controlled Workflow

The Swift Controller is compatible with PCs running Windows 7 or later, and is supplied with extensive software. Test routines can be defined which control the load, temperature and positions of the sample. Results can be displayed and saved for later use.

### Heating and Chilling

The Swift Tensile Stages can be enhanced with heaters and chillers. Heaters and chillers are available for both the flat and EBSD positions. Samples can be heated up to 600°C in air and 1000°C in vacuum. Chilling can reach to 100°C below ambient.

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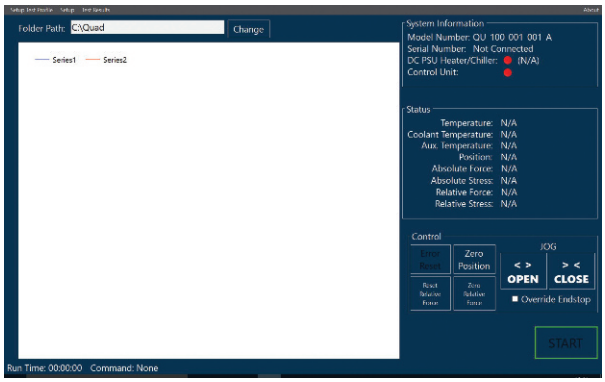
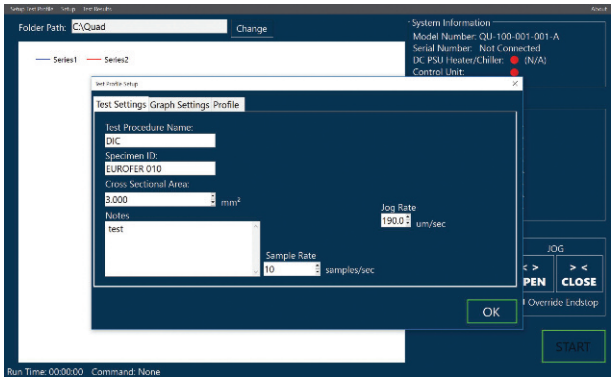
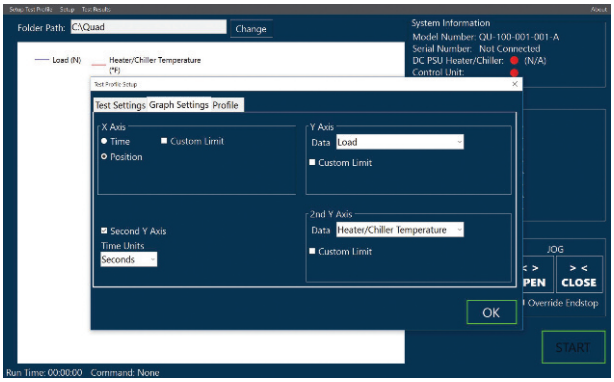
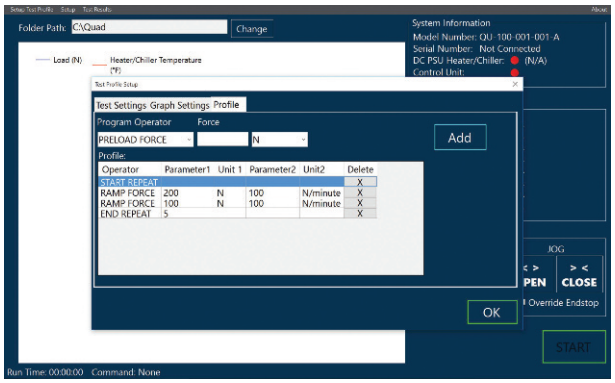
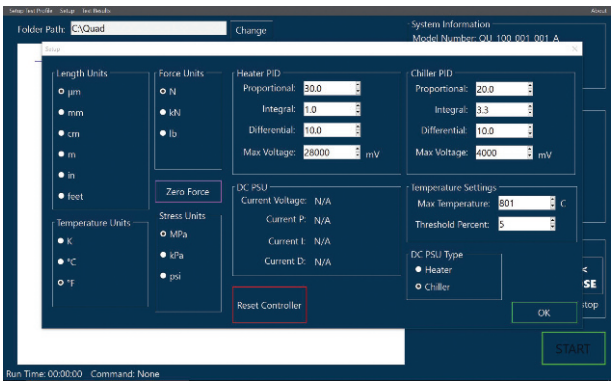
## Swift Instruments SWF 5000 and SWF L5000 Tensile Stages (continued)

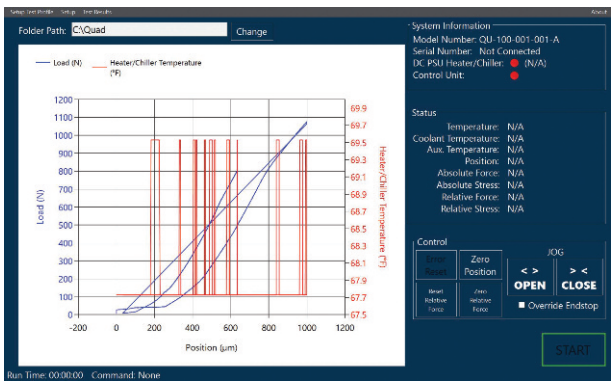



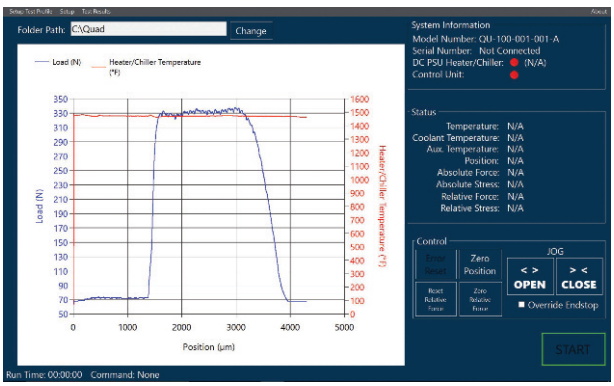



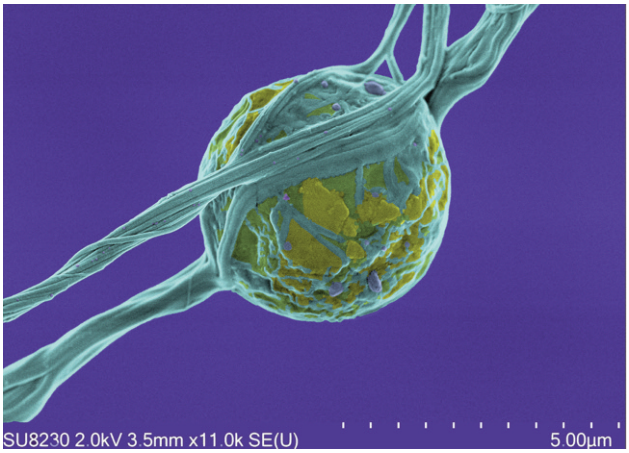



# EQUIPMENT & ACCESSORIES

**Please see the following pages for our latest**

## High-End Vacuum Equipment and Accessories for Materials Science






Algae spore trapped in spider silk coated with 5nm Au x 11k magnification

## Coaters and Coater Targets Replacement Parts

### EMS 450 Carbon Coater

The EMS 400 and 450 Carbon coaters have been replaced by the EMS 150R E Plus.

Parts and accessories for the EMS 450 are listed below.

#### Carbon

| | | |
|---|---|---|
| **91045** | Carbon String, 1 meter | meter |
| **91046** | Carbon Cord, 1 meter | meter |

#### Replacement Parts

| | | |
|---|---|---|
| **91013** | Glass Cylinder 165mm (6") | EMS 450, 500, 550 |
| **91014** | "L" Gaskets to suit 165mm (6") cylinder EMS 450, 500, 550 | 1 pair |

### EMS 500, 550, 575, 650 and 675 Sputter Coaters and EMS 975 and 975S Large Chamber Turbo Evaporator

EMS is pleased to offer the 150 and 300 series sputter coater and combined carbon and sputter coater.

- **EMS150R ES Plus – a combined system with sputtering and carbon fibre coating replaces the EMS 500 and 550.**
- **EMS 150T S Plus replaces the EMS 575X**
- **EMS 300T D Plus replaces the EMS 575XD**
- **EMS 300R T Plus and EMS 300T T Plus replace the EMS 600, EMS 650, and the EMS 675X**

Parts and accessories for the EMS 575, 650, 675 and 975 are listed below.

#### Accessories

| | | |
|---|---|---|
| **92045** | EMS 50 Water Chiller | |

#### Replacement Targets

EMS strives to maintain accurate pricing. However, due to fluctuations in precious metal prices, pricing on products containing precious metals is not guaranteed. We will contact you if there is a discrepancy.

| | | | |
|---|---|---|---|
| **91010** | Gold Target | EMS 500, 550, 575T | each |
| **91011** | Gold/Palladium Target | EMS 500, 550, 575T | each |
| **91012** | Platinum Target | EMS 500, 550, 575T | each |
| **91013** | Chromium Target | EMS 575T | each |
| **91014** | Tungsten Target | EMS 575T | each |
| **91030** | Gold Targets* | EMS 650, 675X | x3 |
| **91031** | Gold/Palladium Targets* | EMS 650, 675X | x3 |
| **91032** | Platinum Targets* | EMS 650, 675X | x3 |
| **91013** | Chromium Targets* | EMS 675X | x3 |
| **91014** | Tungsten Targets* | EMS 675X | x3 |

(*Recommended change as set of three)

#### Replacement Parts

| | | | |
|---|---|---|---|
| **91033** | Glass Cylinder 225mm (8") | EMS 650, 675X, 975, 975S | |
| **91034** | "L" Gaskets to suit 225mm (8") cylinder EMS 650, 675X, 975, 975S | | 1 pair |

#### Replacement Source

| | | | |
|---|---|---|---|
| **91077** | Carbon Rods (6.15mm Dia.), | EMS 975, 975S | 12/pack |



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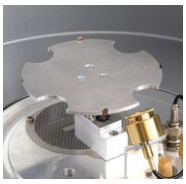
## **Selection Guide:** Specimen Stages for EMS Equipment

*The EMS line of specimen stages meets most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except rotary planetary stage). Examples:*

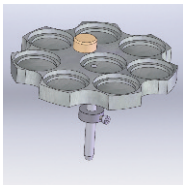
| Cat # | Stage Type | Description | Compatible Equipment |
|---|---|---|---|
| **4500-1** | 50mm | Standard stage with six stub positions for 15 mm or 6.5 mm or 1/8" pin stubs (same as #3330, 6401, 6552) | All EMS Series |
| **4500-2** | Tilt | Rotate-tilt stage with six stub positions for 15 mm or 6.5 mm or 1/8" pin stubs. Tilts Up to 90° from horizontal (same as #3340, 4519, 6400-S, 6551) | All EMS Series |
| **4500-3** | 4" Wafer | Adjusts to accept 2", 3", 4" wafers comes with **4500-6**, a 4" stub holder to accept up to 18 1/8 pin stubs (same as #6549) | All EMS Series |
| **4500-4** | 6" Wafer | Adjusts to accept 4" & 6" wafers comes with **4500-7**, a 6" stub holder to accept up to 27 1/8 pin stubs (same as #6547) | EMS 300 |
| **4500-5** | 8" Wafer | Adjusts to accept 6" & 8" wafers comes with **4500-8**, an 8" stub holder to accept up to 54 1/8 pin stubs | EMS 300T T Plus<br>EMS 300R T |
| **4500-6** | 4" Stub Holder | A 4" stub holder to accept up to 18 1/8 pin stubs | All EMS Series |
| **4500-7** | 6" Stub Holder | A 6" stub holder to accept up to 27 1/8 pin stubs | EMS 300T T Plus<br>EMS 300R T<br>EMS 300T D Plus |
| **4500-8** | 8" Stub Holder | An 8" stub holder to accept up to 54 1/8 pin stubs | EMS 300T T Plus<br>EMS 300R T |
| **4500-9** | 4" Wafer & Offset Gearbox | A combination of **4500-3** and a small gearbox to offset the sample position Enable even coating of up to a 4" sample size. (same as #3360, 4522) | EMS 150T Plus<br>EMS 150R Plus |
| **4500-10** | Fiber Stage | A stage accept single fibers or pins up to 1 mm dia. rotating horizontally to achieve all round coating | EMS 150T Plus<br>EMS 150R Plus |
| **4500-11** | 6" Square Wafer | Stage to accept 6" square wafer or Masks | EMS 300T T Plus<br>EMS 300R T |
| **4500-12** | Rota Cota | "Rota Cota" planetary stage with six stub positions for 15 mm or 6.5 mm or 1/8" pin stubs. Tilts up to 30° from horizontal (same as #4521, 6402, 6553) | EMS 150T Plus<br>EMS 150R Plus |
| **4500-13** | 8 Place Stub | 8 places for 25 or 30mm Polished embedded samples. Includes a polished Brass Tally | All EMS Series |
| **4500-14** | 14 Place Stub | 14 places for 25 or 30mm Polished embedded samples. Includes a polished Brass Tally | All EMS Series |
| **4500-15** | 9 Place Coverslip | A Stage to accept 9 20X20 cover slips. The top part of stage lifts off and has a mechanism to lift the cover slips for easy removal | All EMS Series |
| **4500-16** | 4 Place 25mm Stub | 4 Place 25mm Stub Stage with locking screws. May be fitted to 4500-12 rota cota stage | All EMS Series |
| **4500-17** | Slide Stage | Microscope slide stage for up to two 75 mm x 25 mm slides or eight stub positions for pin stubs. (same as #3370, 4520, 6403, 6554) | All EMS Series |

*4500-2 Tilt Angle*

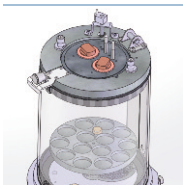


*4500-3 4" Wafer*

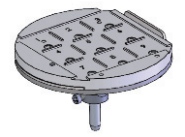
*4500-12 Rotary Planetary*



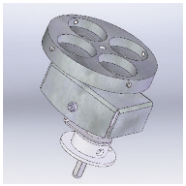
*4500-13 8 Place Stub*



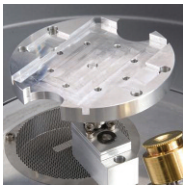
*4500-14 14 Place Stub*



*4500-15 9 Place Coverslip*



*4500-16 4 Place 25mm Stub*



*4500-17 Glass Microscope*

Quorum

# EQUIPMENT & ACCESSORIES

## Why cool?

Low vacuum (LV) or variable pressure (VP) modes are now standard on most scanning electron microscopes (SEMs). For this reason it has become important to control water evaporation from wet specimens. Cooling such specimens reduces the loss of water by evaporation, or - depending on chamber pressure - can prevent it altogether.

Saturated vapour pressure of water decreases considerably with temperature. At room temperature, water will very quickly evaporate - causing considerable damage to specimen composition and ultra-structure. This is due to high forces of surface tension at the drying front as it passing though the specimen. In most biological systems this will result in distortion and collapse of membranes and other structures.

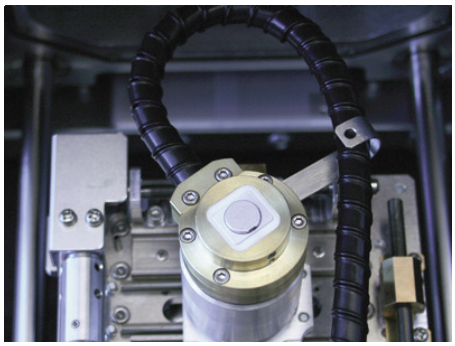
At 300Pa, the specimen temperature needs to be less than -9.5°C, and at 85Pa less than -25°C to stop water evaporation. Therefore, by cooling a specimen to -25°C, chamber pressures up to 85Pa can be used with little or no water loss by evaporation. In this way, changes in specimen structure can be minimised. In addition, being able to operate at higher vacuum gives a better signal-to-noise ratio and clearer images.

## The EMS Coolstage for SEM, LV or VP

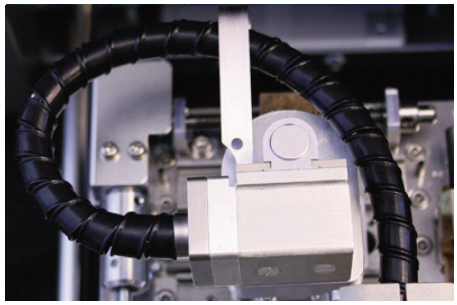
### Overview

The Coolstage is a Peltier-driven SEM cooling stage for scanning electron microscopy (SEM), low vacuum (LV) or variable pressure (VP) applications. The stage can be cooled to sub-zero temperatures for specimens that may be sensitive at ambient temperature, subject to beam damage, or may otherwise 'sublime' (lose water) at ambient temperatures.

There are three versions of coolstage - Standard, Enhanced and Ultra - to cover differing specimen requirements.



Standard Coolstage. Range: -30°C to +50°C at 300Pa



Ultra Coolstage. Range: -50ºC to +50ºC at 300Pa

### Features - Standard Coolstage

- **Temperature range -30°C to +50°C at 300Pa**
- **Self contained cooling - no additional external cooling water needed**
- **Temperature accuracy +/- 1.5°C or 2% - whichever is greater**
- **Minimal image drift**
- **Cooling and heating rates of up to 30°C per minute**
- **Keypad control - with simultaneous display of actual and target temperature**
- **Supplied with SEM chamber port feed-though - specify when ordering**
- **One-year warranty**

### Features - Enhanced Coolstage

- **Temperature range -30°C to +160°C at 300Pa**
- **All other specifications as per Standard Coolstage**

### Features - Ultra Coolstage

- **Temperature range -50°C to +50°C at 300Pa**
- **All other specifications as per Standard Coolstage**

### Product Description


The Coolstage is a temperature-controlled specimen stage that can be fitted to any low vacuum (LV) or variable pressure (VP) scanning electron microscope (SEM).

The Standard Coolstage consists of a single stage Peltier device, onto which a thermally isolated specimen holder and dual temperature sensor is mounted. The Coolstage assembly is mounted onto the SEM stage using an adaptor plate specific to the microscope. Cooling pipes and electrical wires connect to the SEM feedthrough flange. External components are a recirculating water chiller and power supply case, and a compact keypad for digital temperature readout and control.

### Compact, efficient cooling and temperature control

The temperature range of the Standard Coolstage is -30°C to +50°C at 300Pa. The specimen holder is water-cooled using a small, self-contained closed loop recirculating chiller that is normally positioned approx 2m from the SEM. A microprocessor controls and monitors the temperature of the cold stage. A small keypad is used to set the required temperature and display target and current temperatures.

The specimen holder has been designed to minimise image drift due to temperature change, giving a stable image at high magnification. An integrated RS-232 interface allows temperature to be set and read from the SEM.



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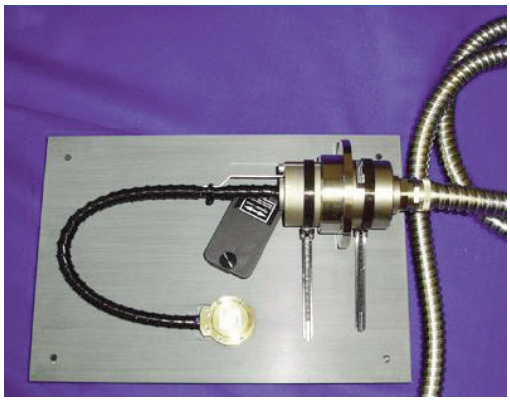
## The EMS Coolstage *(Continued)*

### Rapid specimen exchange

To exchange a specimen it is necessary to increase the specimen stage temperature to ensure that condensation does not form on the specimen or specimen stage. The keypad controller has a convenient 'exchange' button that will automatically take the specimen holder temperature to a programmable temperature from between +5°C to +20°C. Typical cooling and heating rates are up to 30°C per minute.

When not in use, the major parts of the system can be left in situ and the cooling stage is very easily removed when reverting to 'normal' use. A convenient storage block is provided for Coolstage stage assembly and vacuum feedthrough for when the system is not in use.

Coolstage and vacuum feed through connected to the storage block (stage protected by plastic shutter)



Coolstage and vacuum feed through connected to the storage block (with protection shutter open)

Dish-style specimen stub, showing flat bottom side (left) and dish side (right)

## SPECIFICATIONS

Specimen size .....10mm Ø (adaptor stub for 12" Hitachi stubs can be supplied on request)

Stage Temperature Range ..NOTE: Higher vacuum will allow for cooler temperatures, compatible with high vacuum levels to 1x10-5Pa
**Standard Coolstage:** -30°C to +50°C at 300Pa with no external cooling water from SEM (at ambient +20°C)
**Enhanced Coolstage:** 30°C to +160°C at 300Pa with no external cooling water from SEM (at ambient +20°C)
Ultra Coolstage: -50°C to +50°C at 300Pa with no external cooling water from SEM (at ambient +20°C)

Temperature display resolution .....-0.1°C

Temperature stability .....+/- 0.2°C

Temperature accuracy .....+/- 1.5°C or 2% (whichever is greater)

Stage movement .....Normal x, y and z movements maintained. Tilt maintained for X-ray analysis (up to 45°). No rotation

Working distance .....As on SEM, Coolstage is set to the SEM Eucentric height

Operating voltage.....100V or 115V or 230V @ 100VA, voltage tolerance +/- 10%

Size and weight .....Operation/display unit: 90mm L x 112mm W x 350mm H, 300g
Power supply/cooling unit: 305mm L x 245mm W x 330mm H, 15kg

Packed size and weight .....550mm L x 580mm W x 400mm H, 28kg

Supplied with: .....Operating manual, one set of interconnecting cables and mains supply lead, storage block for specimen cooling unit when not in use, specimen holders: 15 x flat 10mm Ø stubs and 15 x dish 10mm Ø OD stubs

## ORDERING INFORMATION

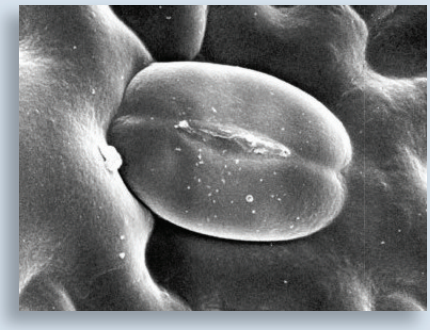
| | | |
|---|---|---|
| **90100** | EMS Standard Coolstage | each |
| **90101** | EMS Enhanced Coolstage | each |
| **90102** | EMS Ultra Coolstage | each |
| **90103** | Flat specimen stubs, 10mm diameter | 10/pk |
| **90104** | Dish style specimen stubs, 10mm external diameter | 10/pk |

## Using the EMS 3500 with Critical Point Dryers

The EMS 3500 will give controlled heating of EMS 3000 and EMS 3100 Critical Point Dryers. It is connected directly to the inlet and outlet of the EMS 3000 or EMS 3100 water jacket. The temperature of the circulating fluid is pre-set, typically set to 37°C (eg just above the critical temperature of carbon dioxide).

**Mature Spruce Wood**

Critical point dried block of mature spruce wood block, demonstrating transverse, tangential and radial views of tracheids and vessels.



**Stomatal Pore on Xerophyte Leaf Surface**

Critical point dried epidermis of a xerophyte (cactus), demonstrating raised stomatal pores.

**Barley Leaf**

Trichomes and stomatal pores on the epidermal surface of a barley (Hordeum vulgare) leaf. Some very fine wax crystallites are also just visible on the surface of the leaf.

# EMS 3500 Thermocirculator

**The EMS 3500 Thermocirculator is a low cost, portable water circulating system for supplying a constant temperature supply for closed and open loop applications at near ambient to +60°C.**

Features

- Precise control of heating
- Compact
- Robust and reliable
- No running water to waste
- Ideal for use with the EMS 3000 and EMS 3100 Critical Point Dryers

The EMS 3500 is suitable for open and closed loop applications and has all controls and liquid connections on the front panel. The temperature controller shows not only the 'set' temperature (between ambient and +65°C), but also the actual liquid temperature. The fluid is circulated by a glandless magnetic pump, through an aluminum reservoir.

A cooling coil is mounted in the liquid reservoir. This coil can be directly connected to the main water supply and is primarily used when temperature control near to ambient is required. The electronic control system features a zero voltage switching unit which minimizes mains electrical interference, enabling the EMS 3500 to be used and sited with other sensitive electronic instruments.

## SPECIFICATIONS

| | |
|---|---|
| **Working temperature range** | Ambient to +65°C |
| **Heating rating** | 500W |
| **Reservoir capacity** | 2.2L / 3.5 Pints |
| **Pump type** | Glandless magnetic drive |
| **Pump motor** | Shaded pole |
| **Pump flow** | 270L/h (zero head) / 60 Gal/hr (zero head) |
| **Pump pressure** | 0.25kg/cm$^2$ / 3.5psi |
| **Max pump head (unrestricted)** | 2.5m / 7.5ft |
| **Size (unpacked)** | 330 x 280 x 150mm / 13 x 11 x 6" |
| **Weight** | 8kg / 17.6lbs |
| **Electrical** | 220-240V/50Hz, 115V/60Hz |

## ORDERING INFORMATION

| | | |
|---|---|---|
| **91095** | EMS 3500 Thermocirculator | each |



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# EMS 4800 Recirculating Heater/Chillers

**Recommended for open and closed loop applications, offering simplicity, reliability and quiet operation. The range includes the EMS 4860, 4870, 4880 and 4890.**

## Features

- Precise temperature control
- Quiet, efficient operation
- Proven reliability
- Low maintenance
- Environmentally friendly- avoids running water to waste

## Temperature control

Many instruments measuring physical properties depend on accurate control of temperature and in some processes optimum temperature is essential. With the EMS 4800 series, over-cooling (which affects efficiency) is prevented and the water temperature can be accurately controlled over the range -10 to +60°C.

A commonly misunderstood feature of refrigerated systems is in applications where the control temperature is other than at or near room temperature. When the instruments are to be operated at controlled temperatures below ambient, the extraction deteriorates significantly and, as a guide, the compounded change is 4% per degree Celsius. In practice, the refrigerant gas pressure has to be adjusted to optimize the performance at any particular temperature. However, the EMS 4800 series incorporate automatic adjustment valves in the systems.

The EMS 4800 series are of the 'closed loop' type and therefore efficiencies are dramatically improved compared with open bath models. They are simple to set up and to operate, and essentially maintenance free.

## Choosing the correct heater/chiller

In order to optimize performance from a heater/chiller system, the correct specification must be selected for a particular application. To cool or heat any instrument or system it is important to obtain the following information from the manufacturer:

- Heat load to be dissipated to water, eg for an electron microscope: diffusion pump heater, lenses, etc
- Flow rate and size of tubing
- Minimum pressure

With this information, consult the Specifications below and select the appropriate heater/chiller. The basic heat load calculation formula is as follows:

**Flow rate x weight of fluid x specific heat x D T = Heat Extraction.**

## Some typical applications

**Vacuum coating equipment**
**Critical point dryers (EMS 3000 and EMS 3100)**
**Electron microscopes**
**Chromatography equipment**
**Electrophoresis baths**
**Environmental chambers**
**Crystal growth apparatus**
**Fermentation equipment**
**Interferometers**
**Photographic baths**
**X-ray equipment**
**Polarimeters, refractometers**
**...and many others**

## SPECIFICATIONS

**Heat Extraction Rates (in Watts)**

| | - 20°C | - 10°C | 0°C | +10°C | + 20°C |
|---|---|---|---|---|---|
| **EMS 4860** | 75W | 105W | 180W | 300W | 420W |
| **EMS 4870** | 125W | 250W | 500W | 900W | 1.2kW |
| **EMS 4880** | 200W | 425W | 700W | 1.6kW | 2.2kW |
| **EMS 4890** | 350W | 600W | 1.2kW | 2kW | 3kW |
| **4.5kW Recirculator** | 700W | 1kW | 2kW | 3kW | 4.5kW |
| **6kW Recirculator** | 800W | 1.3kW | 2.6kW | 4.5kW | 6kW |

| **Model** | **EMS 4860** | **EMS 4870** | **EMS 4880** | **EMS 4890** |
|---|---|---|---|---|
| **Extraction rate at 20°C** | 400W | 1.4kW | 2.2kW | 3kW |
| **Temperature range** | -20°C to +70°C | -20°C to +70°C | -20°C to +70°C | -20°C to +70°C |
| **Refrigeration (HP)** | 1/5 | 1/2 | 3/4 | 1 |
| **Heater rating** | 1kW | 1.5/2.0kW | 2.5kW | 2.5kW |
| **Max pump flow** | 450L/h | 450L/h | 900L/h | 900L/h |
| **200Gal/hr** | 200Gal/hr | 275Gal/hr | 275Gal/hr | |
| **Tank capacity** | 1.2L | 1.7L | 2.3L | 3.0L |
| **Max pump pressure psi/bar** | 12/60psi | 12/60psi | 60psi | 60psi |
| **0.7/3bar** | 0.7/3bar | 1.5/3bar | 1.5/3bar | |
| **Height** | 37cm | 45cm | 50cm | 50cm |
| **Width** | 32cm | 38cm | 45cm | 45cm |
| **Depth** | 46cm | 61cm | 62cm | 62cm |
| **Weight** | 40kg | 62kg | 70kg | 82kg |
| **Water connections** | 16mm hose or 1/8 BSP | 16mm hose or 1/8 BSP | 16mm hose or 1/8 BSP | 16mm hose or 1/8 BSP |
| **Temperature sensor** | R.T. Probe | R.T. Probe | R.T. Probe | R.T. Probe |

## Optional Attachments

- High pressure pump for EMS 4860 and EMS 4870 (standard in EMS 4880 and EMS 4890)
- Water failure alarm
- Over and under temperature cut out

NOTE: Larger capacity heater/chillers (6kW and 12kW) are available on request - please contact us for further information.

- Custom-made heater/chiller units

## ORDERING INFORMATION

| | |
|---|---|
| **91098** | EMS 4860 1/5 HP Recirculating Heater/Chiller |
| **91099** | EMS 4870 1/2 HP Recirculating Heater/Chiller |
| **91090** | EMS 4880 3/4 HP Recirculating Heater/Chiller |
| **91095** | EMS 4890 1 HP Recirculating Heater/Chiller |

*Rapid, reliable results...*

# EMS GloQube™ Glow Discharge System for TEM and Surface Modification

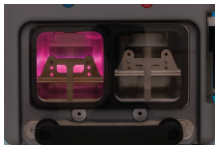
*The EMS GloQube™ is the first-of-its-kind compact, easy to use, stand-alone glow discharge system.*

## KEY FEATURES

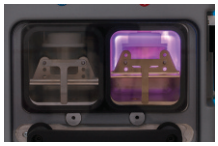
- **Dual independent chambers**
- **Hydrophilic/hydrophobic and negative/positive modes**
- **Fully automatic, short process times**
- **Intuitive touch screen control**
- **Safe vapor delivery using septum-sealed vials**
- **Automatic valving between chambers to prevent cross-contamination**
- **Quick and easy sample loading**
- **Controlled venting to prevent sample disturbance**
- **Consistent, reliable results**
- **Three-year warranty**

## Unique Dual Chamber Processing, Safe Handling of Reagents

The GloQube has two independent vacuum chambers: a clean chamber, designed for applications requiring hydrophobic/hydrophilic conversion, typically using air as the process gas; and a vapor chamber, designed for use with reagents such as methanol and alkylamine. With operator safety firmly in mind, reusable septum-sealed reagent vials are used. Loading and removing reagents is convenient and reliable – the vial, located in its holder, is inserted into a shielded needle using a simple bayonet fitting.



Clean Chamber



Vapor Chamber

To prevent accidental damage, the high voltage lead is shielded. The plasma current is variable by adjustment of the vacuum level using an argon leak valve with the plasma voltage being preset. For maximum sputter coating efficiency, the gas injector system ensures that argon gas enters the chamber close to the plasma discharge. Venting is to argon.

Vapor Delivery System

The primary application of the EMS GloQube™ is the hydrophilization (wetting) of carbon-coated TEM support films and grids which otherwise have the tendency to be hydrophobic. Glow discharge treatment with air will make film surfaces negatively charged and hydrophilic and allow the easy spread of aqueous solutions. This and other processes are outlined below.

## Glow Discharge Process

| Surface State | Charge | Atmosphere | Typical Applications |
|---|---|---|---|
| Hydrophilic | Negative | Air | Carbon coated TEM grids |
| Hydrophilic | Positive | Air – with magnesium acetate post-treatment | Nucleic acid adhesion to carbon films |
| Hydrophilic | Positive | Alkylamine | Proteins, antibodies and nucleic acids |
| Hydrophilic | Negative | Methanol | Positively charged protein molecules (e.g. ferritin, cytochrome c) |

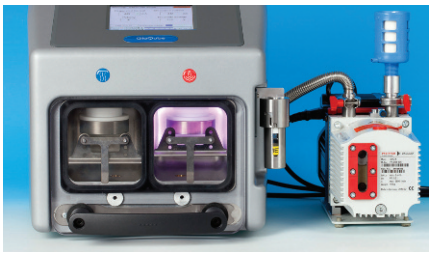
## Easy Sample Loading, Fast Turnaround Times

Each chamber can accommodate two 25 x 75 mm glass microscopes slides. Loading could not be easier using draw-style chamber doors and specimen stages. The stages are height adjustable and fitted with removable glass slide holders. For additional convenience – and to allow easy access for chamber cleaning – the stages can be completely removed.

## III EMS GloQube™ Glow Discharge System for TEM and Surface Modification (continued)

### Vacuum, Automatic Valving and Controlled Venting

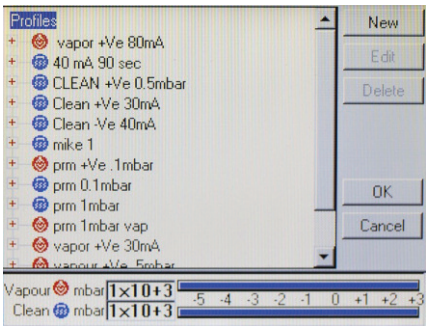
The GloQube™ has automatic valving between chambers which maintains cleanliness by preventing cross-contamination. At the end of a process run, automatic soft venting to atmosphere through filtered inlets ensures TEM grids are not disturbed. The GloQube™ requires a single vacuum pump working in the 0.1 to 1 mbar range. A typical pump time to operational vacuum is 60 seconds.



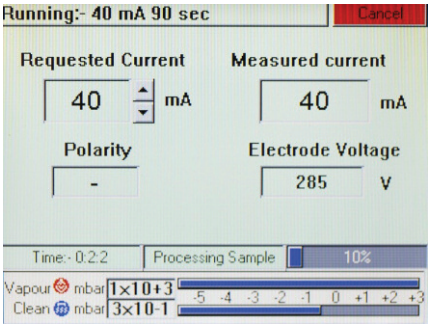
EMS GloQube-D and Optional Pfeiffer DUO 6 Rotary Pump

### Touch Screen Control – Rapid Data Input, Simple Operation

The intuitive touch screen allows multiple users to rapidly input and store preferred process "recipes". Typical default glow discharge protocols are loaded as standard. Additionally, help files and useful maintenance data such as system on time and time since last clean are readily available to the operator. An Ethernet communications port is included for software updates.




Stored Profiles




A Typical Process Run

## SPECIFICATIONS

### Power and Processes

| | |
|---|---|
| **Plasma current** | 1-40 mA |
| **HV power supply** | 30 W |
| **Maximum voltage** | 800 V |
| **Electrode polarity –** | |
| clean chamber | DC glow positive DC glow negative |
| vapor chamber | DC glow positive DC glow negative |
| **Sample stage** | 125 x 100 mm with location for two 25 x 75 mm (1" x 3") glass slides |
| **Sample stage operational height** | Adjustable 12.5 mm (0.5"), 22.5 mm (0.9") or 35 mm (1.38") |
| **Pump hold time requirement** | 0-24 hours |
| **Process time** | 1-600 seconds |

### Safety

| | |
|---|---|
| **Chamber vent inlets** | Filtered air inlets with slow vent to minimize sample disturbance |
| **On-board reagent storage** | Reagents (e.g. methanol or alkylamine) are contained in reusable sealed glass vials to minimize exposure to hazards. (GloQube-D only) |
| **High voltage safety interlocks** | Hardware safety interlocked and software for process control |

### Vacuum

| | |
|---|---|
| **Vacuum control** | Integrated pirani gauge |
| **Working vacuum range** | 0.1 to 1 mbar |
| **Vacuum pump minimum requirements** | 6 $m^3$/hr, 3600 l/m, 0.03 mbar ultimate vacuum. Inlet flange: KF 16 |
| **Pumping time** | Typical pump time to an operational vacuum of 0.27 mbar in 60 sec. |
| **Vacuum isolation** | Isolation valves to switch vacuum and prevent process chamber cross-contamination |

### User Interface

| | |
|---|---|
| **User interface** | Full graphical interface with touch screen buttons and controls. In addition to displaying profiles, parameters, help screen and maintenance information are available |
| **Profiles and profile logging** | Capability to store 100 user profiles (name, date, time, vacuum, current and polarity) |

### Dimensions and Communications

| | |
|---|---|
| **Chamber size** | 100 mm W x 100 mm H x 127 mm D (3.94" x 3.94" x 5") |
| **Instrument size** | 336 mm H x 364 mm D (13.2" x 14.3") |
| **Instrument weight** | 19.5 kg (42.9 lbs) (GloQube-D) |
| **Pump (optional)** | 391 mm W x 127 mm D x 177 mm H (15.4" x 5" x 7") |
| **Pump weight** | 16 kg (35.3 lbs) |
| **Footprint with optional pump** | 366 mm W x 600 mm D x 336 mm H (14.4" x 23.6" x 13.2") |
| **Power requirements** | 120 V 60 Hz, 15 A or 230 V 50 Hz, 10 A |
| **Instrument power rating** | 100-240 V AC 60/50 Hz 700 VA including pump, IEC inlet |
| **Optional pump power rating** | 115/230 V 60/50 Hz 450 W |
| **Communication port** | Ethernet port for instrument software updates |

## ORDERING INFORMATION

| Cat No. | Description | Qty. |
|---|---|---|
| **EMS-Glo-2** | EMS GloQube, Dual chamber glow discharge system. Accessory kit, including: mains power lead, rotary pump power lead, oil mist filter and clamp, 750 mm long flexible stainless steel vacuum tube with clamps, fuses, glass vials, vial caps and sealing washers, needle (spare). Vacuum pump to be ordered separately. | each |
| **Vacuum Pumping** | | |
| **91003** | 5 $m^3$/hr Pfeiffer DUO 6 two-stage rotary vacuum pump with oil mist filter | each |
| **96000** | Oil mist filter (spare) | each |
| **Options, accessories and spares** | | |
| **EMS-Glo-11** | Microscope Slide Tray | each |
| **EMS-Glo-12** | Glass Vial | 10/pk |
| **EMS-Glo-13** | Glass Vial Caps | 3/pk |
| **EMS-Glo-14** | Needle | each |
| **EMS-Glo-15** | Door Seal | each |

Quorum

# EQUIPMENT & ACCESSORIES

## EMS 7620 "Mini" Sputter Coater/Glow Discharge

**The EMS 7620 is a compact, low cost SEM sputter coater that comes complete with a glow discharge option as a standard. When combined with the optional carbon attachment EMS 7640-CF it makes the ideal low cost SEM sputtering and carbon coating system package. The EMS 7620 is robust, easy to operate and is backed up with a three-year warranty.**

### Features

- Low cost
- Simple operation
- Magnetic deflection sputter coating head
- Compact design
- Carbon fiber evaporation option
- Adjustable height specimen stage
- Easy to change sputter targets - gold/palladium (Au/Pd) standard
- Built to all the latest safety standards - features include positive break electro-mechanical interlock which ensures the sputter coating head is electrically isolated when the optional carbon attachment is in use
- Robust and reliable
- Three-year warranty
- Glow discharge as a standard

### Easy operation

The EMS 7620 is ideally suited to the budget-conscious user who none-the-less demands quality results from an easy-to-use instrument. Designed for routine applications, the EMS 7620 uses a basic magnetron sputter head with a simple-to-replace disc target (gold/palladium (Au/Pd) as standard). The head is hinged for easy operation and fitted with electrical safety interlocks.

To prevent accidental damage the high voltage lead is shielded. The plasma current is variable by adjustment of the vacuum level using an argon leak valve with the plasma voltage pre-set. For maximum sputter coating efficiency the gas injector system ensures that argon gas enters the chamber close to the plasma discharge. Venting is to argon.

### Fast cycle times

The 100mm/4" diameter Pyrex cylinder is mounted on an aluminium collar and sealed with O rings. The small vacuum chamber means pump-down times and cycle times are fast; it also allows a small economical rotary pump to be used.

The specimen stage is height-adjustable over a wide range and can easily be removed to accommodate larger specimens. The system is controlled manually by a 180-second timer with 15-second resolution. Pressure and plasma current are monitored by analogue meters.

### Glow discharge (hydrophilisation)

A three-way switch on the front panel allows the EMS 7620 to be switched to glow discharge mode.

Freshly-made transmission electron microscopy (TEM) carbon support films tend to have a hydrophobic surface that hinders the collection of TEM sections from the surface of water baths and prevents the spreading of suspensions of particles in negative staining solutions. However, after glow discharge treatment with air, carbon film can be made hydrophilic and negatively-charged, thus allowing collection of TEM sections and easy spreading of aqueous suspensions.

Other possible treatments include magnesium acetate treatment to create hydrophobic and positively-charged surfaces. If alkylamine is used as a process gas, the carbon film surface will become hydrophobic and positively-charged, while using methanol as a process gas results in the surface becoming hydrophobic and negatively-charged. Such treatments can allow the optional absorption of selected biomolecules.

The EMS 7620 also comes complete with 1m x 12mm bore vacuum hose and fittings, and requires only the addition of a rotary pump with a capacity of 50L/m or greater - see Options and Accessories.

### Specifications

**Dimensions:**.....340mm W x 130mm D x 250mm H (unpacked) excluding chamber

**Site Requirements:**

**Electrical:** Ensure that a suitable mains electricity supply (110VAC - 20A or 240VAC - 13A, frequency 50/60Hz) is available. Check that the voltage label attached to the side of the cabinet is suitable for the local voltage and frequency. The units are supplied for either 230V or 110V operation at 50/60Hz. The power rating is 250VA excluding the rotary pump. The rotary pump outlet is rated at 230V at 10A or 110V at 16A. The 240V pump outlet uses either a three-pin plug (404440310) or 110V standard US plug - both supplied.

**Sputtering Gas:** Ensure that a suitable gas supply is available, such as a commercial cylinder of argon gas (Zero Grade) fitted with a two-stage regulator, in order to deliver gas at a pressure of around 5-10psi (0.5bar).

**Vacuum Pump:** Ensure that a suitable vacuum pump is available. The work chamber has to be evacuated to less than 10-2mbar. This can be achieved in a reasonable time (depending on the cleanliness of the chamber) using a floor-mounted 50L/m or 90L/m two-stage rotary pump. Alternatively you can use a 30L/m desk-top mounted two-stage rotary pump, preferably incorporating an anti suck-back device and fitted with an oil mist filter on the exhaust port. Where a rotary pump is used, ensure that it has been filled with oil, in accordance with the manufacturer's instructions. The exhaust should be filtered or expelled to a safe area. All pumps we supply are fitted with an exhaust filter.

**Carbon evaporation attachment (optional)**:The EMS 7640-CF Carbon Accessory Power Supply can be used in conjunction with the EMS 7640 'Mini' Sputter Coater. The units are supplied for either 230V or 110V operation at 50/60Hz. Ensure that a suitable mains electricity supply (110VAC - 20A or 240VAC - 13A, frequency 50/60Hz) is available. Check that the voltage label attached to the side of the cabinet is suitable for the local voltage and frequency.

**Space requirement:** 340mm W x 320mm D x 310mm H (including chamber and sputtering head). Weight: 14kg. Additional space is required for the rotary pump, which can be located either on the floor or on the bench with the coater.

### Options and Accessories

A carbon coating accessory **(EMS 7640-CF)** which consists of an evaporation power supply and carbon fiber head is available. Fitting the optional carbon evaporation attachment is simple. The normal sputtering head is tilted back and replaced with the carbon fiber head. Connection is then made to the power supply. To ensure that the exposed sputtering head cannot be powered when the add-on carbon head is under vacuum, a positive-break mechanical interlock ensures electrical isolation of the sputtering head. We also offer a 'stand alone' SEM carbon coater, see the EMS 450X.



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## EMS 7620 (*continued*)

### Choosing a target

Gold/Palladium (Au/Pd): Supplied as standard. Has the same properties (sputtering rate, secondary electron yield, cost) as gold but the sputtered grain size is smaller.

Gold (Au): Gold sputter coating is still widely used in many laboratories

Platinum (Pt): The sputtered grain size is smaller than gold or gold/palladium. Platinum has a slower sputtering rate and is more expensive than gold or gold/palladium.

Silver (Ag): Compared to the other metals, it is relatively easy to remove silver. Therefore it is useful for museum and forensic specimens.

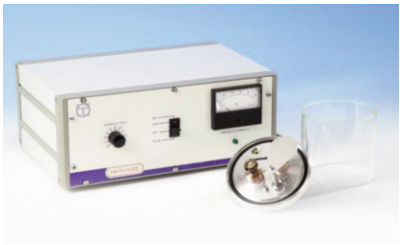
Palladium (Pd): Sometimes used instead of gold, gold/palladium and platinum for x-ray microanalysis.

All targets are 57mm Ø x 0.1mm thick (unless specified otherwise)

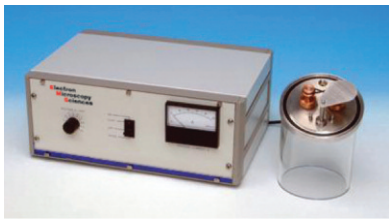
### Ordering Information

| Cat No. | Description | |
|---|---|---|
| **EMS 7620** | 'Mini' Sputter Coater | each |
| | Supplied with: 91017-AP gold/palladium (Au/Pd) target, 1m length of 12mm bore flexible vacuum hose, 1 x KF25 hose adapter flange and fittings to fit a rotary pump, 1 x rotary pump plug, comprehensive operating instructions | |
| **91017-Au** | Gold (Au) target | each |
| **91017-AP** | Gold/palladium (Au/Pd) target | each |
| **91017-Pt** | Platinum (Pt) target | each |
| **91017-Ag** | Silver (Ag) target | each |
| **91017-Pd** | Palladium (Pd) target | eacht |
| **91017-.2-Au** | Gold target (Au) 0.2mm thick | each |
| **91017-.2-AP** | Gold/palladium (Au/Pd) target 0.2mm thick | each |
| **91017-.2-Pt** | Platinum (Pt) target 0.2mm thick | each |
| **91003** | RV-3 two-stage rotary pump with oil mist filter (115/230V 50/60Hz) | each |
| **96000** | Replacement compact oil mist filter | each |
| **96001** | Replacement compact oil mist filter cartridge | each |
| **91040** | Carbon evaporation attachment — EMS 7620 | each |

Optional carbon fibre evaporation attachment and controller



Optional carbon fibre evaporation attachment and controller (fitted)



## EMS 7620-CF Carbon Accessory Power Supplies

### The 7620-CF carbon attachments are modular add-ons for our sputter coaters, allowing carbon fiber or carbon rod evaporation.

Each attachment uses the existing chamber and vacuum system of the sputter coater and is therefore a costeffective and efficient method for the evaporation of carbon for SEM applications. Note that the diameter of the top plate will vary according to the chamber size of the sputter coater onto which it is being fitted. We also offer free-standing carbon evaporators - see the EMS 150R1 and EMS 150T.

TThe EMS 7640-CF, EMS 7640-CR and EMS 7620-CF can be used in conjunction with the EMS 7620 (EMS 7620-CF), EMS 500X, EMS 550X, EMS 575X, EMS 650X and EMS 675X sputter coaters. Sometimes it is also possible to retrofit one of the above onto our older models, Please contact us for information on compatibility.

The attachment consists of two components - a free-standing power supply and a carbon fiber or carbon rod head to suit the chamber size of the sputter coater onto which it is to be fitted.

The power supply is switchable between 10V/100A (for carbon rod evaporation) and 20V/50A (for carbon fiber evaporation). A vacuum interlock is provided to ensure safe operation of the sputter coater and carbon accessory system. Out-gas and coat switches are provided for complete control of the evaporation sequence.

### Ordering Information

| Sputter Coater | Attachment | Attachment |
|---|---|---|
| EMS 7620 Sputter Coater | Not Available | EMS 7620-CF |
| EMS 500X, EMS 550X, EMS 575X, EMS 675X | EMS 7640-CR | EMS 7640-CF |

### Carbon fiber cord

| | | |
|---|---|---|
| **91046-1** | Carbon fiber cord - standard grade - 1m | |
| **91046-10** | Carbon fiber cord - standard grade - 10m | |
| **91046-100** | Carbon fiber cord - standard grade - 100m | |
| **91047-1** | Carbon fiber cord - high purity - 1m | |
| **91047-5** | Carbon fiber cord - high purity - 5m | |
| **91046** | Carbon fiber cord - standard purity, fine strands - 1m | |
| **91046-4** | Carbon fiber cord - standard purity, fine strands - 10m | |
| **91046-01** | Carbon fiber cord - standard purity, fine strands - 100m | |
| **70210-10** | Shaped ('stepped') carbon rods - high purity - 3.05mm Ø x 50mm | pack of 10 |
| **70210-25** | Shaped ('stepped') carbon rods - high purity - 6.15mm Ø x 50mm | pack of 10 |

NOTE: 3.05mm diameter carbon rods are used with the EMS 950X, EMS 450X and EMS 350. 6.15mm diameter carbon rods are used with the K975X and with most older Polaron-branded carbon evaporators.

### Features

- Carbon rod or fiber
- Protection shutter
- Modular control electronics
- Interlocking for safe operation
- Three-year warranty

### Specifications

| | |
|---|---|
| **Dimensions** | 235mm W x 350mm D x 175mm H. |
| **Weight** | 15kg |
| **Carbon source** | Carbon fiber, carbon cord |
| **Ammeter gauge** | 0-50A |
| **Low voltage** | 25V |
| **Out-gas current** | Selectable for carbon fiber or carbon rod |
| **Electrical supply** | 230V/50Hz (3A max), 115V/60Hz (6A max) |

# EMS 150V Plus Automatic Coater


## For ultra-fine coatings

## QUICK OVERVIEW

The EMS 150V Plus is optimized for high-vacuum applications, with an ultimate vacuum of 1 x 10-6 mbar. Together with the use of a wide-range Penning/Pirani gauge, this enables the sputtering of oxidizing metals with ultra-fine grain sizes, which are suitable for high resolution imaging. The lower background pressure removes oxygen nitrogen and water vapour from the chamber, avoiding chemical reactions during the sputter process, which could otherwise lead to impurities or defects in the coatings. Similarly, lower scattering allows for high purity, amorphous carbon films of high density.

The EMS 150V Plus offers all the benefits of the EMS 150T Plus, but with a finer grain size and thinner coating, for ultra-high-resolution applications (above x 200,000 magnification).

## KEY FEATURES

- **Ultimate vacuum of 1x10$^{-6}$mbar**
- **New multi-color LED visual status indicator**
- **16Gb of flash memory can store more than 1000 recipes**
- **New software sorts recipes per user according to recent use**
- **Multiple-user profiles can be set up on one machine**
- **New touch and swipe capacitive screen**

## PRODUCT DESCRIPTION

The EMS 150V Plus is available in three configurations:

**EMS 150V S Plus** — an automatic sputter coater for oxidizing metals with ultra-fine grain size. Available sputtering targets include chromium, iridium and all noble metals

**EMS 150V E Plus** — an automatic carbon coater (rod/cord) for TEM applications. For carbon coating TEM grids.

**EMS 150V ES Plus** — a combined system capable of both sputtering and carbon coating. The deposition head inserts can be swapped in seconds. Metal evaporation/aperture cleaning option available.

### New user interface has been thoroughly updated:

- Capacitive touch screen is more sensitive for ease of use
- User interface software has been extensively revised, using a modern smartphone-style interface
- Comprehensive context-sensitive help screen
- USB interface allows easy software updates and backing up/copying of recipe files to USB stick
- Process log files can be exported via USB port in .csv format for analysis in Excel or similar. Log files include date, time and process parameters.
- 16GB of flash memory can store more than 1000 recipes
- Dual-core ARM processor for a fast, responsive display

Allows multiple users to input and store coating recipes, with a new feature to sort recipes per user according to recent use.

Intelligent system logic automatically detects which insert is in place and displays the appropriate operating settings and controls for that process.

System prompts user to confirm target material and it then automatically selects appropriate parameters for that material.

### Recommended applications for EMS 150 V Plus:

- **Ultra-high-resolution magnification SEM**
- **Carbon coating of TEM grids**
- **Protective platinum layers for FIB**
- **R&D of corrosion-, friction-, and wear- protective layers**
- **Protective layers on medical devices**
- **BSE imaging**
- **EDX, WDS, EBSD analysis**
- **Carbon coating of replicas**
- **Nano-technology e.g. Zeolites, polymer nanobrushes**

***These products are for Research Use Only.***

Intuitive software allows the most inexperienced or occasional operator to rapidly enter and store their own process data. For convenience a number of typical sputtering and carbon coating recipes are already stored but also allows the user to create their own. Software detects failure to achieve vacuum in a set period of time and shuts down the process in case of vacuum leak, which ensures pump protection from overheating.

### Automatic, controlled carbon rod evaporation for TEM applications

Careful evaporation allows precise control of carbon thickness (with or without the optional film thickness monitor). The quality of the resulting carbon films is also enhanced by the eradication of “sparking” that is a common feature of less advanced coaters.

For reproducible high-quality carbon films, we would recommend the use of shaped carbon rods. Rods are higher purity, less susceptible to debris and easier to control. Pulsed and ramped carbon rod recipes are supplied as standard.



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## EMS 150V Plus Automatic Coater (*continued*)

### Cool magnetron sputtering

Sputter coating is a technique widely used in various applications; it is possible to create a plasma and sputter metals with high voltage, poor vacuum and no automation. However, this is not suitable for electron microscopy applications because it will heat the sample and can result in damage when the plasma interacts with the sample. The EMS 150V Plus series uses low temperature enhanced-plasma magnetrons optimized for the turbomolecular pump pressures, combined with low current and deposition control, which ensures your sample is protected and uniformly coated.

The EMS 150V S Plus and EMS 150V ES Plus use easy-change, 57 mm diameter, disc-style targets which are designed to sputter oxidizing and noble metals. The EMS 150V S Plus and EMS 150V ES Plus are fitted as standard with a chromium (Cr) sputter target. Other targets options include: Au, Au/Pd, Pt/Pd, Pd, Pt, Cu, Ir, W, ITO and Al. Others are available on request.

### Pulsed cleaning for Al sputtering

Aluminum (Al) rapidly forms an oxide layer, which can be difficult to remove, but the ES & S Plus have special recipes for aluminum that reduce the oxide removal time and prevent excessive pre-sputtering of the target.

### Interchangeable plug-in heads

This allows the user to configure the system as a sputter coater, evaporator or glow discharge system - all in one space saving format. A carbon cord evaporation insert is available as an option. Automatic detection of the head type when changed.

### Detachable chamber with built-in implosion guard

Removable glass chamber and easily accessible base and top plate allows for an easy cleaning process.

Users can rapidly change the chamber, if necessary, to avoid cross contamination of sensitive samples.

Tall chamber option is available for carbon evaporation to avoid sample heating, to improve uniformity for sputtering and to hold taller samples.

### Multiple stage options

The EMS 150V Plus has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except for the rotary planetary stage).

Some examples:

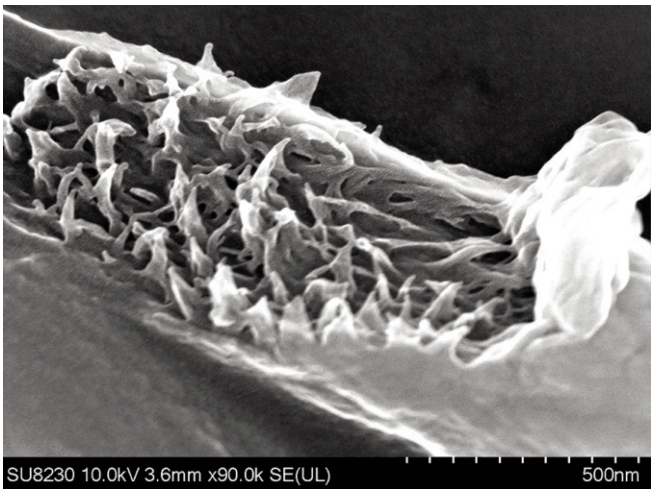
- Rotation stage (supplied as standard): 50 mm Ø can accommodate six standard stubs. Height can be pre-set.
- Rotate-tilt stage for improved uniform coating: 50 mm Ø. Tilt and height can be pre-set.
- Variable angle, rotary planetary stage for heavily contoured samples.
- Large flat rotation stage with offset gear box for 4"/100 mm wafers.
- Rotation stage for glass microscope slides.

*Other options are available on request.*

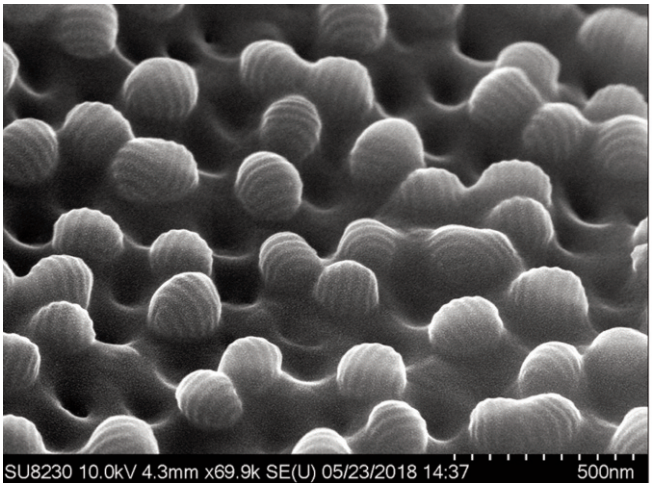
### Safety

The EMS 150V Plus meets key industry CE standards

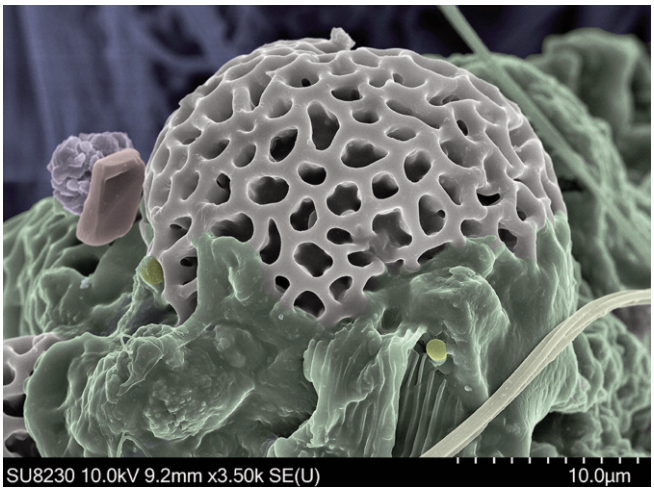
- All electronic components are protected by covers
- Implosion guard prevents user injury in event of chamber failure
- Vacuum interlocks remove power from deposition sources to prevent user exposure to high voltage in event of chamber being opened
- Electrical interlocks remove power when source head cover opened
- Overheating protection shuts down power supply




Single electrospinning fibre tear coated with 1nm Au x 90k magnification




Microsporangium, spore size 150nm, coated with 3nm of Au x 70k magnification




*Radiolata*, colorized

Quorum

# EQUIPMENT & ACCESSORIES

## EMS 150V Plus Automatic Coater (*continued*)

### SPECIFICATIONS

| | |
|---|---|
| **Instrument Case** | 585 mm W x 470 mm D x 410 mm H (total height with coating head open: 650 mm) |
| **Weight** | 33.4 kg (packed: 42 kg) |
| **Packed Dimensions** | 725 mm W x 660 mm D x 680 mm H |
| **Work Chamber** | Borosilicate glass 150 mm ID x 133 mm H |
| **Display** | 115.5mm W x 86.4mm H (active area), 640 RGB x 480 (display format), capacitive touch color display |
| **User interface** | Full graphical interface with touch screen buttons, includes features such as a log of the last 1000 coatings and reminders for when maintenance is due. |
| **Sputter Target** | Disc-style 57 mm Ø. A 0.3 mm thick chromium (Cr) is fitted as standard. V S and V ES versions only |
| **Specimen stage** | 50 mm Ø rotation stage with rotation speed of 8-20 rpm. Other stages available on request. |

#### Vacuum

| | |
|---|---|
| **Rotary Pump** | 5 $m^3$/hr two-stage rotary pump with oil mist filter. Hydraulically-formed bellows stainless-steel backing line. |
| **Turbo Pump** | Internally mounted 70 L/s air-cooled |
| **Vacuum Measurement** | Wide range gauge (10428) |
| **Ultimate Vacuum** | 1 x $10^{-6}$ mbar |

Typical ultimate vacuum of the pumping system in a clean instrument after pre-pumping and venting with dry nitrogen gas

| | |
|---|---|
| **Pump Down Time** | 5x$10^{-6}$ mbar in 30 mins* |
| **Sputter Vacuum Range** | Between 5 x $10^{-3}$ and 1 x $10^{-1}$mbar for gold targets |

#### Processes

| | |
|---|---|
| **Sputtering** | Sputter current 0-150 mA to a predetermined thickness (with optional FTM) or by the built-in timer. The maximum sputtering time is 60 minutes (without breaking vacuum and with automatically built-in cooling periods) |
| **Evaporation** | Carbon evaporation using rods/cord. Thermal evaporation of metals from filaments or boats. For cleaning TEM apertures a standard molybdenum boat (supplied) can be fitted |

#### Visual Status Indicator

A large multi-colour status indicator light provides a visual indication of the state of the equipment, allowing users to easily identify the status of a progress at a distance.

The indicator LED shows the following states:

- Initialization
- Process Running
- Idle
- Coating in Progress
- Process Completed
- Process Ended in Fault Condition

Audio indication also sounds on completion of the process.

### ORDERING INFORMATION

**EMS 150V S Plus** each

**5700** EMS 150V S Plus Sputter Coater optimized for high-vacuum applications. High resolution turbomolecular pumped capacitive touch-screen controled sputter coater with status LED indicator, including quick release sputter insert and one 57 mm diameter x 0.3 mm chromium target. A rotating specimen stage, 50 mm diameter, supplied as standard.

**EMS 150V E Plus** each

**5710** EMS 150V E Plus Carbon Evaporator optimized for high-vacuum applications. Turbomolecular pumped capacitive touch-screen controled carborn evaporator with status LED indicator suitable for TEM and SEM applications. Fitted with a carbon rod evaporation head for 3.05 mm diameter carbon rods. Supplied with carbon rods (C5422 3.05 mm x 300 mm) and a carbon rod shaper (manual operation). A rotating specimen stage, 50 mm diameter, supplied as standard.

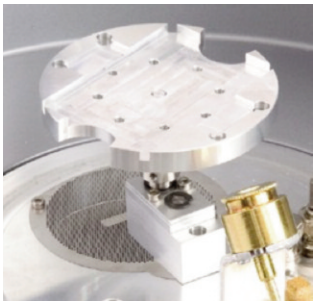
**EMS 150V ES Plus** each

**5720** EMS 150V ES Plus Combined Sputtering and Carbon Coating System optimized for high-vacuum applications. The deposition heads can be swapped in seconds and the intelligent system logic automatically recognizes which head is in place and displays the appropriate operating settings. Consists of high resolution turbomolecular pumped capacitive touch-screen controled sputter coater and carborn evaporator with status LED indicator, including quick release sputter insert and one 57 mm diameter x 0.3 mm chromium target, and high vacuum carbon rod evaporation coater, including quick-release carbon rod insert for 3.05 mm diameter carbon rods. Coating inserts are interchangeable. A rotating specimen stage, 50 mm diameter, supplied as standard.

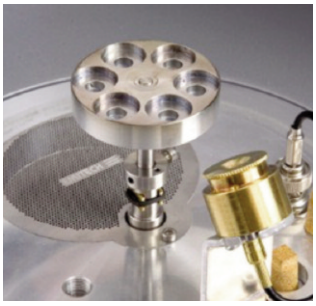
**Rotary pump requirements (needs to be ordered separately)**

**91003** Edwards RV3 50L/s two-stage rotary pump, with vacuum hose, coupling kit and oil mist filter each

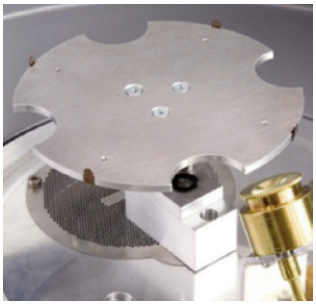
**6550-A** Diaphragm pump. A "dry" alternative to the standard 91003 oil-based rotary pump complete with vacuum hose, coupling kit and oil mist filter each



Microscope slide stage



Rotation stage



Wafer stage

Rotacota planetary stage



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## EMS 150V Plus Automatic Coater (*continued*)

### ORDERING INFORMATION (continued)

#### Options and Accessories

Including details of coating head inserts and specimen stages that are fitted as standard.

**Coating head options**

A range of interchangeable, plug-in style coating head inserts are available:

| | | |
|---|---|---|
| **3200** | Sputtering head insert suitable for oxidizing and non-oxidizing metals. Supplied with a 54 mm x 0.3 mm thick chromium (Cr) target as standard. For additional targets see Sputtering Targets section | each |
| **3210** | Additional sputter insert for quick metal change (V E and V ES versions only). Note: this is an entire sputtering assembly. | each |
| **3230** | Carbon rod evaporation head insert (for 3.05 mm Ø rods) | each |
| **3240** | Carbon rod evaporation head insert (for 6.15 mm Ø rods). Note that EMS recommends 3.05 mm Ø rods as they offer greater process control and are more economical (less wastage). | each |
| **3250** | Carbon fiber evaporation head insert | each |
| **3260** | Metal evaporation and aperture cleaning head insert, including the ability to evaporate upwards or downwards (V E and V ES versions only). Supplied with a pack of ten tungsten filaments and a molybdenum boat. | each |
| **3270** | Extended height vacuum chamber (214 mm high – the standard chamber is 127 mm high). For increased source to sample distance and for coating large specimens | each |
| **3280** | Rotating vacuum spigot allows more convenient connection of the vacuum hose to the rear of the EMS 150V Plus when bench depth is limited | each |
| **3290** | Film thickness monitor (FTM) attachment. Consists of a built in chamber mounted quartz crystal oscillator (includes crystal). As sputtered or evaporated material is deposited onto the crystal, so its frequency of oscillation is modified. This 'modification' is used to measure and control the thickness of material deposited | each |
| **3300** | Spare quartz crystal for FTM. | each |
| **3320** | Full range vacuum gauge for low and high vacuum measurement (a low vacuum Pirani gauge is fitted as standard) | each |
| **4513** | Glow discharge insert to modify surface properties (e.g. hydrophobic to hydrophilic conversion) or to clean surface residues (VS and V ES only). Can be retrofitted | each |

**Specimen stages**

The EMS 150V Plus has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except rotary planetary stage):

| | | |
|---|---|---|
| **3330** | Rotation stage, 50 mm Ø (supplied as standard). This stage only rotates – no tilt or height adjustment | each |
| **3340** | Rotate-tilt specimen stage with adjustable tilt (up to 90 degrees) and height (37 mm-60 mm). Tilt angle can be preset. 50 mm Ø specimen platform with six stub positions for 15 mm or 6.5 mm or ⅛" pin stubs. Stage rotation speed variable between 8 and 20rpm | each |
| **3350** | Variable angle "Rotacota" rotary planetary stage with 50 mm Ø specimen platform. Has six stub positions for 15 mm or 6.5 mm or ⅛" pin stubs. Stage rotation speed variable between 8 and 20rpm | each |
| **3360** | Flat rotation specimen stage for 100 mm / 4" wafers, includes gearbox for increased coverage. Stage rotation speed variable between 8 and 20rpm | each |
| **3370** | Rotating specimen stage for glass microscope slides (up to two x 75 mm x 25 mm slides). Stage rotation speed variable between 8 and 20rpm. Includes gear box to allow optional FTM to be used | each |

#### Sputtering Targets

The EMS 150V S Plus and EMS 150V ES Plus are fitted as standard with a 0.3 mm thick chromium (Cr) sputter target. Other optional targets:

| | | |
|---|---|---|
| **3410** | 57 mm Ø x 0.1 mm Gold | each |
| **3411** | 57 mm Ø x 0.1 mm Gold/Palladium (80/20) | each |
| **3412** | 57 mm Ø x 0.1 mm Platinum | each |
| **3413** | 57 mm Ø x 0.1 mm Nickel | each |
| **3414** | 57 mm Ø x 0.1 mm Silver | each |
| **3415** | 57 mm Ø x 0.1 mm Palladium | each |
| **3416** | 57 mm Ø x 0.1 mm Copper | each |
| **3417** | 57 mm Ø x 0.3 mm Chromium | each |
| **3418** | 57 mm Ø x 0.5 mm Tungsten | each |
| **3419** | 57 mm Ø x 1.5 mm Chromium | each |
| **3420** | 57 mm Ø x 0.2 mm Tungsten | each |
| **3421** | 54 mm Ø x 1.5 mm Carbon | each |
| **3422** | 57 mm Ø x 0.1 mm Aluminum | each |
| **3423** | 57 mm Ø x 0.1 mm Platinum/Palladium (80/20) | each |
| **3424** | 57 mm Ø x 1.5 mm Titanium | each |
| **3425** | 57 mm Ø x 0.3 mm Platinum/Palladium (80/20) | each |
| **3426** | 57 mm Ø x 0.3 mm Gold | each |
| **3427** | 57 mm Ø x 0.3 mm Gold/Palladium (80/20) | each |
| **3428** | 57 mm Ø x 0.3 mm Platinum | each |
| **3429** | 57 mm Ø x 0.5 mm Titanium | each |
| **3430** | 57 mm Ø x 0.1 mm Iron | each |
| **3431** | 57 mm Ø x 0.3 mm Iridium | each |
| **3432** | 57 mm Ø x 0.1 mm Cobalt | each |
| **3433** | 57 mm Ø x 0.1 mm Tin | each |
| **3434** | 57 mm Ø x 0.1 mm Molybdenum | each |
| **3435** | 57 mm Ø x 0.3 mm Magnesium | each |
| **3436** | 57 mm Ø x 0.1 mm Tantalum | each |
| **3437** | 57 mm Ø x 3 mm Indium Tin Oxide (90/10) | each |

**Carbon supplies**

| | | |
|---|---|---|
| **3500** | Carbon rods – 6.15 mm Ø x 100 mm length (unshaped) pack of 10 | each |
| **3510** | Carbon rods – 6.15 mm Ø x 50 mm length (shaped) pack of 10 | each |
| **3520** | Carbon rods – 3.05 mm Ø x 50 mm length (shaped) pack of 10 | each |
| **3530** | Carbon rods 3.05 mm Ø x 300 mm length (unshaped) pack of 10 | each |
| **3540** | Carbon fiber cord – high purity – 1m | each |
| **3550** | Carbon fiber cord – high purity – 5m | each |
| **3560** | Carbon fiber cord – standard grade – 1m | each |
| **3570** | Carbon fiber cord – standard grade – 10m | each |
| **3580** | Carbon fiber cord – standard grade – 100m | each |
| **3590** | Manual rod shaper for 6.15 mm Ø carbon rods | each |
| **3595** | Manual rod shaper for 3.05 mm Ø carbon rods | each |

**Other consumables and spare kits**

| | | |
|---|---|---|
| **3600** | Metal evaporation basket – pack of 10 (for use with metal evaporation head) | each |
| **3610** | Two-year spares kit for EMS 150V S Plus Includes: chromium (Cr) target, glass cylinder, carbon fiber cord, quartz crystals, O-rings | each |
| **3620** | Two-year spares kit for EMS 150V E Plus Includes: chromium (Cr) target, glass cylinder, carbon fiber cord, carbon fiber – fine, carbon rods 3.05 mm, quartz crystals, O-rings | each |
| **3630** | Two-year spares kit for EMS 150V ES Plus Includes: chromium (Cr) target, glass cylinder, carbon fiber cord, carbon fiber – fine, carbon rods 3.05 mm, quartz crystals, O-rings | each |

# EMS 150R Plus Rotary Pumped Coater


## QUICK OVERVIEW

The EMS 150R Plus is suitable for use with Tungsten/$LaB_6$ SEM and Benchtop SEM.

### Typical uses

Sputter coating of noble metals using the EMS 150R S Plus & EMS 150R ES Plus

Recommended for magnifications:
- Up to x 50k using Au, Au/Pd
- Up to x 100k using Pt (optional)

Carbon cord coating for elemental analysis using the EMS 150R S Plus & EMS 150R ES Plus.

## KEY FEATURES

- **Capable of achieving vacuum of 2 x $10^{-3}$ mbar**
- **New touch and swipe capacitive screen**
- **USB port for upgrades and download of log files**
- **Multiple-user profiles can be set up on one machine**
- **New software sorts recipes per user, according to recent use**
- **16GB of memory can store more than 1000 recipes**
- **New multi-color LED visual status indicator**
- **Interchangeable stage options and plug-in heads**

## PRODUCT DESCRIPTION

The EMS 150R Plus is available in three configurations:

- EMS 150R S Plus – An automatic sputter coater for non-oxidizing metals. Available sputtering targets including gold, gold/palladium and platinum.
- EMS 150R E Plus – An automatic carbon cord coater for SEM applications such as EDS and WDS.
- EMS 150R ES Plus – A combined system system capable of both sputtering and carbon coating. The deposition heads can be swapped in seconds.

### Improved Interface

- Capacitive touch screen is more sensitive for ease of use
- User interface software has been extensively revised, using a modern smartphone-style interface
- Comprehensive context-sensitive help screen
- USB interface allows easy software updates and backing up/copying of recipe files to USB stick
- Process log files can be exported via USB port in .csv format for analysis in Excel or similar. Log files include date, time and process parameters.
- 16GB of flash memory can store more than 1000 recipes
- Dual-core ARM processor for a fast, responsive display

Allows multiple users to input and store coating recipes, with a new feature to sort recipes per user according to recent use.

Intelligent system logic automatically detects which insert is in place and displays the appropriate operating settings and controls for that process.

System prompts user to confirm target material and it then automatically selects appropriate parameters for that material.

### Recommended applications for EMS 150 R Plus:

- **Low and medium magnifications**
- **SE signal boost (1nm or less)**
- **Table-top SEM coating**
- **Elemental analysis**
- **Copper metallization layers**

***These products are for Research Use Only.***

Intuitive software allows the most inexperienced or occasional operator to rapidly enter and store their own process data. For convenience a number of typical sputtering and carbon coating profiles are already stored but also allows the user to create their own.

Software detects failure to achieve vacuum in a set period of time and shuts down the process in case of vacuum leak, which ensures pump protection from overheating.

### Automatic, controlled pulsed carbon cord evaporation

The carbon evaporation process can be terminated using the optional film thickness monitor, which incorporates a quartz crystal monitor, fitted as standard on E and ES models. This recipe ensures that carbon is evaporated in short controlled pulses, which has two effects: protecting the sample from heating and ensuring the accuracy of the film thickness monitor. Pulsing also significantly reduces the amount of debris (including large carbon fragments) associated with traditional carbon "flash" evaporation. Pulsed and ramped carbon rod recipes are supplied as standard.

### Cool Magnetron Sputtering

Sputter coating is a technique widely used in various applications; it is possible to create a plasma and sputter metals with high voltage, poor vacuum and no automation. However, this is not suitable for electron

## EMS 150R Plus *(continued)*

microscopy applications because it will heat the sample and can result in damage when the plasma interacts with the sample. The EMS 150R Plus series uses low temperature enhanced-plasma magnetrons optimized for the rotary pump pressures, combined with low current and deposition control, which ensures your sample is protected and uniformly coated.

The EMS 150R S Plus and EMS 150R ES Plus use easy-change, 57 mm diameter, disc-style targets which are designed to sputter non-oxidizing (noble) metals – ideal for W-SEM applications. The EMS 150R S Plus and EMS 150R ES Plus are fitted as standard with a gold (Au) sputter target.

Other targets options include Au/Pd, Pt/Pd, Pd, and Cu. Platinum (Pt) can also be sputtered with the optional Pt coating vacuum hose assembly.

### Interchangeable Plug-in Heads

This allows the user to configure the system as a sputter coater, evaporator or glow discharge system – all in one space saving format. A carbon cord evaporation insert is available as an option. Automatic detection of the head type when changed.

### Detachable chamber with built-in implosion guard

Removable glass chamber and easily accessible base and top plate allows for an easy cleaning process.

Users can rapidly change the chamber, if necessary, to avoid cross contamination of sensitive samples.

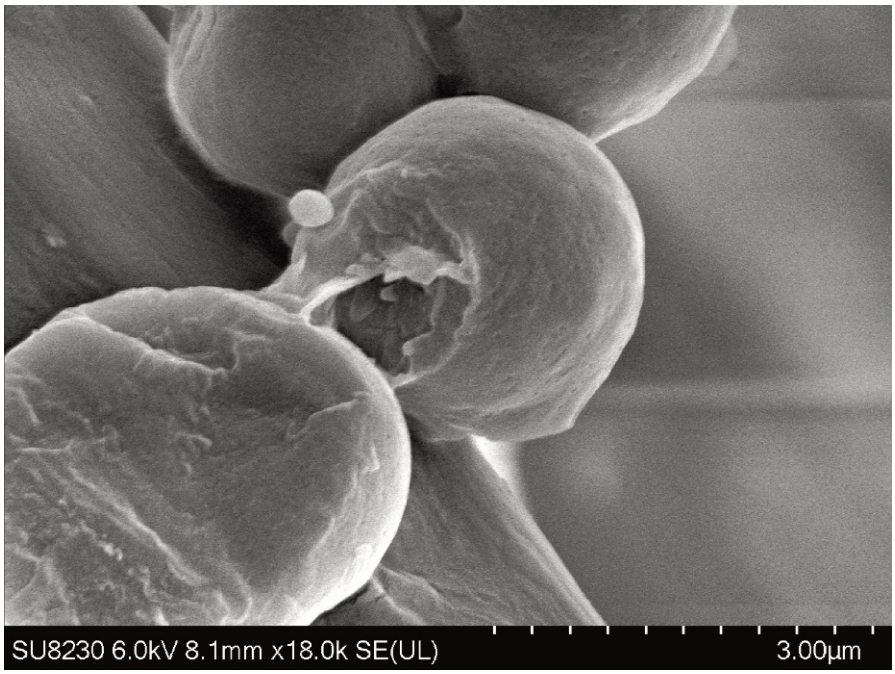
Tall chamber option is available for carbon evaporation to avoid sample heating, to improve uniformity for sputtering and to hold taller samples.

### Multiple stage options

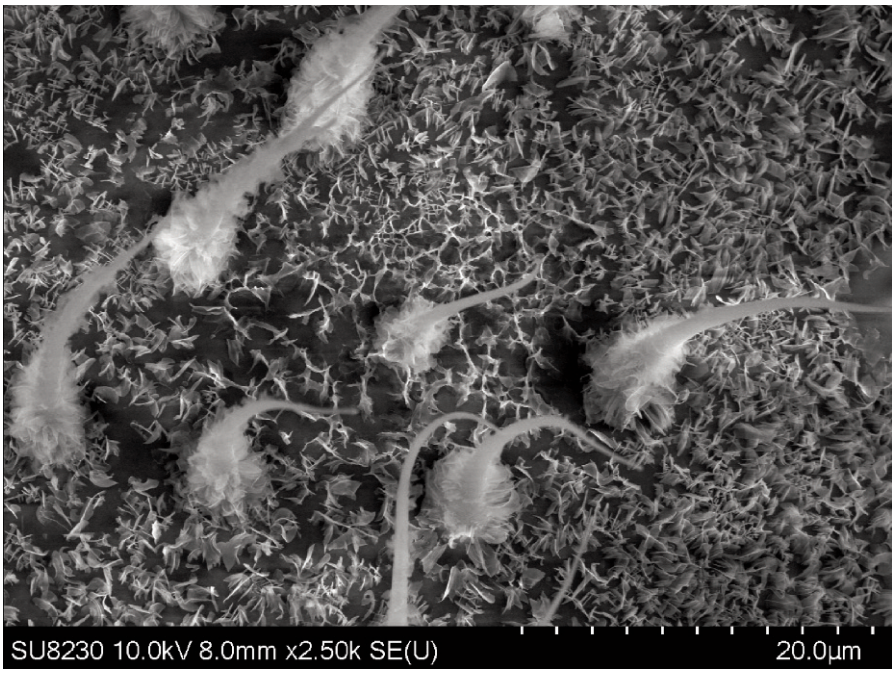
The EMS 150R Plus has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except for the rotary planetary stage). Some examples:

- Rotation stage (supplied as standard): 50 mm Ø can accommodate six standard stubs. Height can be pre-set.
- Rotate-tilt stage for improved uniform coating: 50 mm Ø. Tilt and height can be pre-set.
- Variable angle, rotary planetary stage for heavily contoured samples
- Large flat rotation stage with offset gear box for 4"/100 mm wafers
- Rotation stage for glass microscope slides

Other options are available on request.




Pure silk coated 10nm Au x 18k magnification




Ladybird larvae hair coated 10nm Au x 2.5k magnification

continued ››››

Quorum

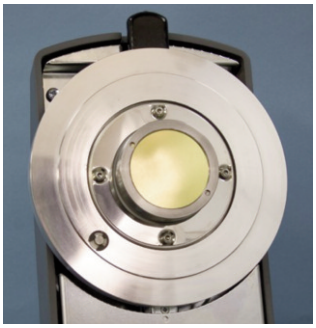
# EQUIPMENT & ACCESSORIES

## EMS 150R Plus *(continued)*

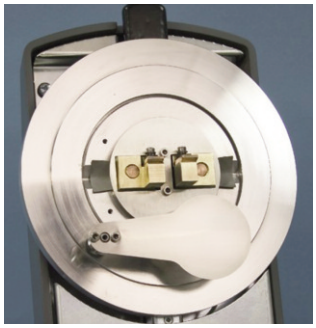
### Safety

The EMS 150R Plus meets key industry CE standards:

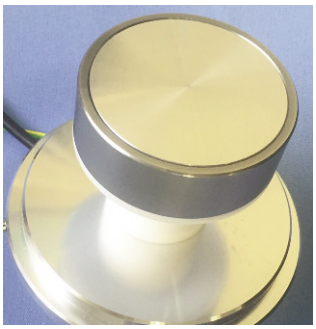
- All electronic components are protected by covers
- Implosion guard prevents user injury in event of chamber failure
- Vacuum interlocks remove power from deposition sources to prevent user exposure to high voltage in event of chamber being opened
- Electrical interlocks remove power when source head cover opened
- Overheating protection shuts down power supply



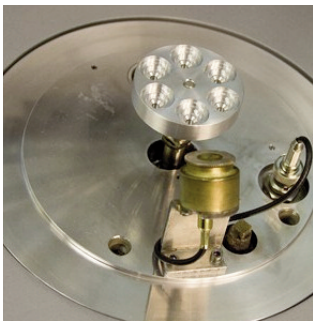
Sputtering insert. Gold (Au) fitted as standard, but other metals available



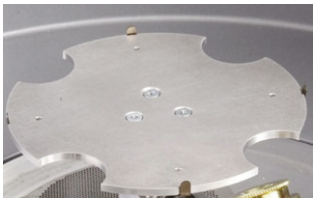
Carbon fiber evaporation insert and automatic source shutter



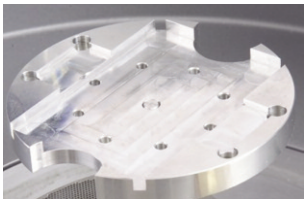
10262 optional glow discharge attachment (for R S and R ES versions)



Base plate. Standard specimen stage and optional film thickness monitor (FTM)



Optional flat rotation stage for 100 mm/4 wafers



Optional rotation stage for glass microscope slides

## SPECIFICATIONS

| | |
|---|---|
| **Instrument Case** | 585mm W x 470mm D x 410mm H<br>Total height with coating head open is 650 mm |
| **Weight** | 28.4 kg (Packed 42 kg) |
| **Packed Dimensions** | 725 mm W x 660 mm D x 680 mm H |
| **Work Chamber** | Borosilicate glass 150 mm ID x 127 mm H |
| **Display** | 115.5 mm W x 86.4 mm H (active area), 640 RGB x 480 (display format), capacitive touch color display |
| **User Interface** | Full graphical interface with touch screen buttons, includes features such as a log of the last 1000 coatings and reminders for when maintenance is due |
| **Sputter Target** | Disc-style 57 mm Ø 0.1 mm thick gold (Au) target is fitted as standard. R S and R ES versions only |

### Specimen Stage

50 mm Ø rotation stage with rotation speed of 8-20 rpm.
Other stages available on request.

### Vacuum

| | |
|---|---|
| **Rotary Pump** | Optional 5 $m^3$/hr two-stage rotary pump with oil mist filter (order separately) |
| **Vacuum Measurement** | Pirani gauge |
| **Ultimate Vacuum** | 2 x $10^{-2}$ mbar |
| *Typical ultimate vacuum of the pumping system in a clean instrument after pre-pumping with dry nitrogen gas* | |
| Sputter Vacuum Range | Between 7 x $10^{-3}$ and 1 x $10^{-1}$ mbar for gold |

### Processes

| | |
|---|---|
| **Sputter Deposition Current** | Single target: 1 - 140mA<br>All targets: 60 - 420mA |
| **Visual Status Indicator** | A large status multi-color indicator light provides a visual indication of the state of the equipment, allowing users to easily identify the status of a process at distance. |

The indicator LED shows the following states:

- Initialization
- Process running
- Idle
- Coating in progress
- Process completed
- Process ended in fault condition

Audio indication also sounds on completion of the process.



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## EMS 150R Plus *(continued)*

## ORDERING INFORMATION

### EMS 150R S Plus

| | | |
|---|---|---|
| **4500** | EMS 150R S Plus Fully automatic, capacitive touch-screen controlled rotary-pumped sputter coater with status LED indicator. **Including:** quick-release sputter insert, one 57 mm diameter x 0.1 mm gold target, and 50 mm diameter rotating specimen stage. | |

### EMS 150R E Plus

| | | |
|---|---|---|
| **4503** | EMS 150R E Plus Fully automatic, capacitive touch-screen controlled rotary pumped carbon fiber evaporation coater with status LED indicator. **Including:** quick-release carbon fiber insert for evaporation of carbon cord, carbon fiber cord, and 50 mm diameter rotating specimen stage. | |

### EMS 150R ES Plus

| | | |
|---|---|---|
| **4507** | EMS 150R ES Plus Fully automatic, capacitive touch-screen controlled rotary pumped sputter coater and carbon evaporator with status LED indicator. **Including:** quick release sputter insert, one 57 mm diameter x 0.1 mm gold target, and carbon fiber evaporation coater, including quick-release carbon fiber insert for evaporation of carbon cord*, and 50 mm diameter rotating specimen stage. *Coating inserts are interchangeable and can be swapped in seconds. The intelligent system logic automatically recognises which insert is in place and displays the appropriate operating settings. | |

## Options and Accessories

### Head inserts and glow discharge

| | | |
|---|---|---|
| **4511** | Additional sputter insert for quick metal change (R E and R ES only). Note: this is an entire sputtering assembly – individual noble metal targets can also be purchased | |
| **4512** | Carbon rod evaporation insert for 3.05 mm Ø rods (R E and R ES only). Includes manual rod shaper and 3.05 mm Ø carbon rod | |
| **4513** | Glow discharge insert to modify surface properties (e.g. hydrophobic to hydrophilic conversion) or to clean surface residues (R S and R ES only). Can be retrofitted | |
| **4514** | Additional standard glass chamber assembly | |
| **4515** | Extended height vacuum chamber (214 mm high – the standard chamber is 127 mm high). For increased source to sample distance and for coating large specimens | |
| **4516** | Rotating vacuum spigot allows more convenient connectionof the vacuum hose to the rear of the EMS150R when bench depth is limited | |
| **4517** | Film thickness monitor (FTM) attachment. Consists of a built in chamber mounted quartz crystal oscillator (includes crystal). As sputtered or evaporated material is deposited onto the crystal, so its frequency of oscillation is modified. This "modification" is used to measure and control the thickness of material deposited | |
| **4518** | Spare quartz crystal | each |

### Specimen stages

All rotating stages have variable rotation of between 8 and 20 rpm.

| | | |
|---|---|---|
| **4519** | 50 mm Ø rotate-tilt specimen stage with adjustable tilt (up to 90 degrees) and height (37 mm-60 mm). Has six stub positions for 15 mm or 6.5 mm or ⅛" pin stubs. Stage rotation speed variable between 8 and 20rpm | each |
| **4520** | 90 mm Ø rotating specimen stage for glass microscope slides (up to two x 75 mm x 25 mm slides). Stage rotation speed variable between 8 and 20rpm | each |
| **4521** | Variable angle "Rotacota" rotary planetary stage with 50 mm Ø specimen platform. Has six stub positions for 15 mm or 6.5 mm or 1/8" pin stubs. Stage rotation speed variable between 8 and 20rpm | each |
| **4522** | Flat rotation specimen stage for 100 mm/4" wafers, includes gearbox for increased coverage. Stage rotation speed variable between 8 and 20rpm | each |

### Carbon Supplies

| | | |
|---|---|---|
| **4538** | Carbon fiber cord – high purity – 1m | |
| **4539** | Carbon fiber cord – high purity – 5m | |
| **4540** | Carbon fiber cord – standard grade – 1m | |
| **4541** | Carbon fiber cord – standard grade – 10m | |
| **4542** | Carbon fiber cord – standard grade – 100m | |
| **4543** | Carbon rods – 3.05 mm Ø x 50 mm length (shaped) pack of 10 | |
| **4544** | Carbon rods 3.05 mm Ø x 300 mm length (unshaped) pack of 10) | |
| **4546** | Manual rod shaper for 3.05 mm Ø carbon rods | |

### Sputtering Targets

| | | |
|---|---|---|
| **4523** | 57 mm Ø x 0.1 mm Gold | each |
| **4524** | 57 mm Ø x 0.2 mm Gold | each |
| **4525** | 57 mm Ø x 0.3 mm Gold | each |
| **4526** | 57 mm Ø x 0.1 mm Gold/Palladium (80/20) | each |
| **4527** | 57 mm Ø x 0.2 mm Gold/Palladium (80/20) | each |
| **4528** | 57 mm Ø x 0.3 mm Gold/Palladium (80/20) | each |
| **4529** | 57 mm Ø x 0.1 mm Platinum | each |
| **4530** | 57 mm Ø x 0.2 mm Platinum | each |
| **4531** | 57 mm Ø x 0.3 mm Platinum | each |
| **4532** | 57 mm Ø x 0.1 mm Nickel | each |
| **4533** | 57 mm Ø x 0.1 mm Silver | each |
| **4534** | 57 mm Ø x 0.1 mm Palladium | each |
| **4535** | 57 mm Ø x 0.1 mm Copper | each |
| **4536** | 57 mm Ø x 0.1 mm Platinum/Palladium (80/20) | each |
| **4537** | 57 mm Ø x 0.3 mm Platinum/Palladium (80/20) | each |

### Spare Kits

| | | |
|---|---|---|
| **4547** | Two-year spares kit for EMS150R S Includes: 57 mm Ø x 0.1 mm gold target, standard glass chamber assembly quartz crystals, O-rings | |
| **4548** | Two-year spares kit for EMS150R E Includes: carbon fiber / cord, standard glass chamber assembly, quartz crystals, O-rings, springs | |
| **4549** | Two-year spares kit for EMS150R ES Includes: 57 mm Ø x 0.1 mm gold target, carbon fiber / cord, standard glass chamber assembly, quartz crystals, O-rings, springs | |

# EMS 150T Plus Turbomolecular Pumped Coater


## QUICK OVERVIEW

The EMS 150T Plus is optimized for use with a turbomolecular pump, which gives a lower vacuum down to 5 x 10-5 mbar. This enables the sputtering of oxidizing metals, which have a lower grain size suitable for high-resolution imaging. Similarly, lower scattering allows for high purity, amorphous carbon films of high density.

### Typical uses

Sputter coating of noble and oxidizing metals using the EMS 150T S Plus & EMS 150T ES Plus:

Recommended for magnifications::
- Up to x 50k using Au, Au/Pd
- Up to x 100k using Pt
- above x 100k using Cr, Ir(optional)

Ideal for thin film applications such as coating with ITO, W, Al, Zn.

## KEY FEATURES

- **New touch and swipe capacitive screen**
- **USB port for upgrades and download of process log files**
- **Multiple-user profiles can be set up on one machine**
- **New software sorts recipes per user according to recent use**
- **16GB of memory can store more than 1000 recipes**
- **New multi-color LED visual status indicator**
- **Capable of achieving vacuum of 5 x 10-5 mbar**

## PRODUCT DESCRIPTION

The EMS 150T Plus is available in three configurations:

- EMS 150T S Plus – An automatic sputter coater for non-oxidizing metals. Sputtering targets include; Cr, Ir, W, ITO, Al. Other targets available.
- EMS 150T E Plus – An automatic carbon cord coater for SEM applications such as EDS and WDS. Metal evaporation/aperture cleaning option available.
- EMS 150T ES Plus – A combined system system capable of both sputtering and carbon coating. The deposition heads can be swapped in seconds. Metal evaporation/aperture cleaning option available.

### Improved Interface

- Capacitive touch screen is more sensitive for ease of use
- User interface software has been extensively revised, using a modern smartphone-style interface
- Comprehensive context-sensitive help screen
- USB interface allows easy software updates and backing up/copying of recipe files to USB stick
- Process log files can be exported via USB port in .csv format for analysis in Excel or similar. Log files include date, time and process parameters.
- 16GB of flash memory can store more than 1000 recipes
- Dual-core ARM processor for a fast, responsive display

Allows multiple users to input and store coating recipes, with a new feature to sort recipes per user according to recent use.

Intelligent system logic automatically detects which insert is in place and displays the appropriate operating settings and controls for that process.

System prompts user to confirm target material and it then automatically selects appropriate parameters for that material.

Intuitive software allows the most inexperienced or occasional operator to rapidly enter and store their own process data. For convenience a number of typical sputtering and carbon coating profiles are already stored but also allows the user to create their own.

Software detects failure to achieve vacuum in a set period of time and shuts down the process in case of vacuum leak, which ensures pump protection from overheating.

### Recommended applications for EMS 150 T Plus:

- **High-resolution magnification SEM**
- **Protective platinum layers for FIB**
- **R&D of corrosion-, friction-, and wear protective layers**
- **Protective layers on medical devices**
- **BSE imaging**
- **EDX, WDS, EBSD analysis**
- **Carbon coating of replicas**

***These products are for Research Use Only.***

### Controlled ramped carbon rod evaporation

Careful evaporation allows precise control of carbon thickness (with or without the optional film thickness monitor). The quality of the resulting carbon films is also enhanced by the eradication of "sparking" that is a common feature of less advanced coaters.

For reproducible high-quality carbon films, we would recommend the use of shaped carbon rods. Rods are higher purity, less susceptible to debris and easier to control. Pulsed and ramped carbon rod recipes are supplied as standard.

## EMS 150T Plus *(continued)*

### Cool Magnetron Sputtering

Sputter coating is a technique widely used in various applications; it is possible to create a plasma and sputter metals with high voltage, poor vacuum and no automation. However, this is not suitable for electron microscopy applications because it will heat the sample and can result in damage when the plasma interacts with the sample. The EMS 150T Plus series uses low temperature enhanced-plasma magnetrons optimized for the rotary pump pressures, combined with low current and deposition control, which ensures your sample is protected and uniformly coated.

The EMS 150T S Plus and EMS 150T ES Plus use easy-change, 57 mm diameter, disc-style targets which are designed to sputter oxidizing and noble metals. The EMS 150T S Plus and EMS 150T ES Plus are fitted as standard with a chromium (Cr) sputter target. Other targets options include Au, Au/Pd, Pt/Pd, Pd, Pt, Cu, Ir, W, ITO and Al. Others are available on request.

### Pulsed cleaning for Aluminum sputtering

Aluminum (Al) rapidly forms an oxide layer which can be difficult to remove, but the EMS 150T ES Plus & EMS 150T S Plus have special recipes for Al that reduce the oxide removal time and prevent excessive pre-sputtering of the target.

### Interchangeable plug-in heads

This allows the user to configure the system as a sputter coater, evaporator or glow discharge system – all in one space saving format. A carbon cord evaporation insert is available as an option. Automatic detection of the head type when changed.

### Detachable chamber with built-in implosion guard

Removable glass chamber and easily accessible base and top plate allows for an easy cleaning process. Users can rapidly change the chamber, if necessary, to avoid cross contamination of sensitive samples. Tall chamber option is available for carbon evaporation to avoid sample heating, improved uniformity for sputtering and to hold taller samples.

### Multiple stage options

The EMS 150T Plus has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except for the rotary planetary stage).

Some examples:

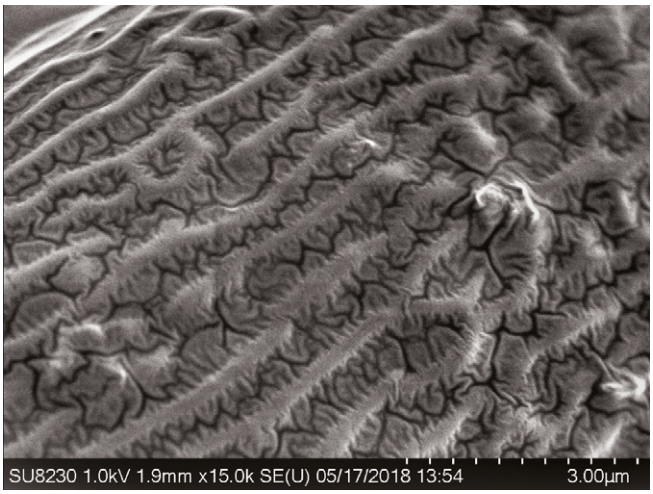
- Rotation stage (supplied as standard): 50 mm Ø can accommodate six standard stubs. Height can be pre-set.
- Rotate-tilt stage for improved uniform coating: 50 mm Ø. Tilt and height can be pre-set.
- Variable angle, rotary planetary stage for heavily contoured samples.
- Large flat rotation stage with offset gear box for 4"/100 mm wafers.
- Rotation stage for glass microscope slides.

Other options are available on request.

### Safety

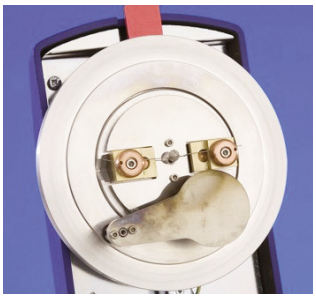
The EMS 150T Plus meets key industry CE standards

- All electronic components are protected by covers
- Implosion guard prevents user injury in event of chamber failure
- Vacuum interlocks remove power from deposition sources to prevent user exposure to high voltage in event of chamber being opened
- Electrical interlocks remove power when source head cover opened
- Overheating protection shuts down power supply

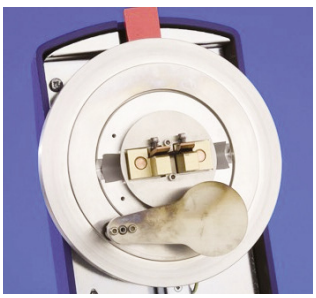



Pollen coated in 3nm Au x15k magnification on EMS 150T Plus

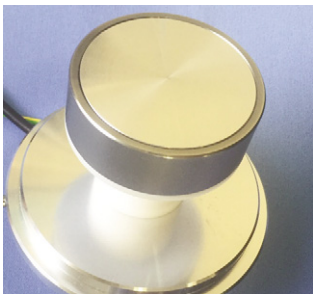
Sputter coater insert (standard with T S and T ES)



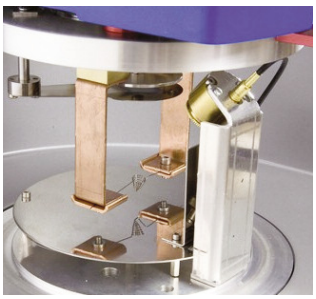
Metal evaporation insert (set up for downwards evaporation)



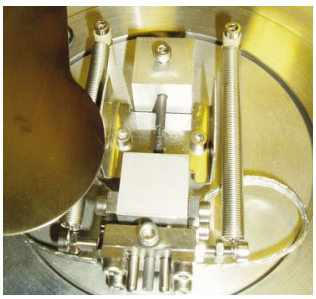
Carbon cord evaporation insert option



Optional glow discharge attachment (for T S and T ES versions)



Metal evaporation insert (set up for upwards evaporation)



Carbon rod evaporation insert

# EQUIPMENT & ACCESSORIES

## EMS 150T Plus *(continued)*

## SPECIFICATIONS

| | |
|---|---|
| **Instrument Case** | 585mm W x 470mm D x 410mm H<br>Total height with coating head open is 650 mm |
| **Weight** | 28.4 kg (Packed 42 kg) |
| **Packed Dimensions** | 725 mm W x 660 mm D x 680 mm H |
| **Work Chamber** | Borosilicate glass 150 mm ID x 127 mm H |
| **Display** | 115.5 mm W x 86.4 mm H (active area), 640 RGB x 480 (display format), capacitive touch color display |
| **User Interface** | Full graphical interface with touch screen buttons, includes features such as a log of the last 1000 coatings and reminders for when maintenance is due |
| **Sputter Target** | Disc-style 57 mm Ø 0.1 mm thick gold (Au) target is fitted as standard. R S and R ES versions only |

### Specimen Stage

50 mm Ø rotation stage with rotation speed of 8-20 rpm.
Other stages available on request.

### Vacuum

| | |
|---|---|
| **Rotary Pump** | Optional 5 $m^3$/hr two-stage rotary pump with oil mist filter (order separately) |
| **Vacuum Measurement** | Pirani gauge |
| **Ultimate Vacuum** | 2 x $10^{-2}$ mbar |

*Typical ultimate vacuum of the pumping system in a clean instrument after pre-pumping with dry nitrogen gas*

| | |
|---|---|
| Sputter Vacuum Range | Between 7 x $10^{-3}$ and 1 x $10^{-1}$ mbar for gold |

### Processes

| | |
|---|---|
| **Sputter Deposition Current** | Single target: 1 - 140mA<br>All targets: 60 - 420mA |
| **Visual Status Indicator** | A large status multi-color indicator light provides a visual indication of the state of the equipment, allowing users to easily identify the status of a process at distance. |

The indicator LED shows the following states:

- Initialization
- Process running
- Idle
- Coating in progress
- Process completed
- Process ended in fault condition

Audio indication also sounds on completion of the process.

## ORDERING INFORMATION

**EMS 150T S Plus**

**3380** EMS 150T S Plus Sputter Coater. High resolution turbomolecular pumped capacitive touch-screen controlled sputter coater with status LED indicator. Includes quick release sputter insert and one 57 mm diameter x 0.3 mm chromium target. Rotating specimen stage, 50 mm diameter, supplied as standard.

**EMS 150T E Plus**

**3390** EMS 150T E Plus Carbon Evaporator. Turbomolecular pumped capacitive touch-screen controlled carbon evaporator with status LED indicator suitable for TEM and SEM applications. Fitted with a carbon rod evaporation head for 3.05 mm diameter carbon rods. Supplied with carbon rods (3.05 mm x 300 mm) and a carbon rod shaper (manual operation). Rotating specimen stage, 50 mm diameter, supplied as standard.

**EMS 150T ES Plus**

**3400** EMS 150T ES Plus Combined Sputtering and Carbon Coating System. The deposition heads can be swapped in seconds and the intelligent system logic automatically recognizes which head is in place and displays the appropriate operating settings. Consists of high resolution turbomolecular pumped capacitive touch-screen controlled sputter coater and carbon evaporator with status LED indicator, including quick release sputter insert and one 57 mm diameter x 0.3 mm chromium target, and high vacuum carbon rod evaporation coater, including quick-release carbon rod insert for 3.05 mm diameter carbon rods. Coating inserts are interchangeable. Rotating specimen stage, 50 mm diameter, supplied as standard.

### Options and Accessories

Including details of coating head inserts and specimen stages fitted as standard.

**Coating head options**

A range of interchangeable, plug-in style coating head inserts are available:

| | | |
|---|---|---|
| **3200** | Sputtering head insert suitable for oxidizing and non-oxidizing metals. Supplied with a 54 mm x 0.3 mm thick chromium (Cr) target as standard. For additional targets see Sputtering Targets section | each |
| **3210** | Additional sputter insert for quick metal change. Note: this is an entire sputtering assembly. | each |
| **3230** | Carbon rod evaporation head insert (for 3.05 mm Ø rods) | each |
| **3240** | Carbon rod evaporation head insert (for 6.15 mm Ø rods). Note that EMS recommends 3.05 mm Ø rods as they offer greater process control and are more economical (less wastage). | each |
| **3250** | Carbon fiber evaporation head insert | each |
| **3260** | Metal evaporation and aperture cleaning head insert, including the ability to evaporate upwards or downwards (T E and T ES versions only). Supplied with a pack of ten tungsten filaments and a molybdenum boat. | each |
| **3270** | Extended height vacuum chamber (214 mm high – the standard chamber is 127 mm high). For increased source to sample distance and for coating large specimens | each |
| **3280** | Rotating vacuum spigot allows more convenient connection of the vacuum hose to the rear of the EMS 150T Plus when bench depth is limited | each |
| **3290** | Film thickness monitor (FTM) attachment. Consists of a built in chamber mounted quartz crystal oscillator (includes crystal). As sputtered or evaporated material is deposited onto the crystal, so its frequency of oscillation is modified. This 'modification' is used to measure and control the thickness of material deposited | each |
| **3300** | Spare quartz crystal for FTM. | each |
| **13530** | Standard coating shield assembly | each |
| **27691** | Extended glass cylinder assembly, 220 mm H | each |
| **3320** | Full range vacuum gauge for low and high vacuum measurement (a low vacuum Pirani gauge is fitted as standard) | each |



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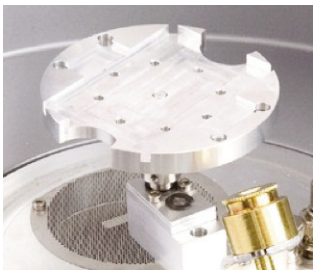
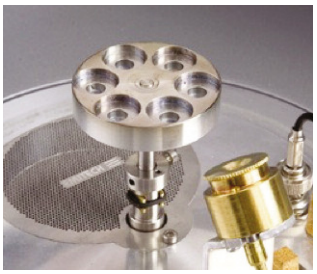
## EMS 150T Plus *(continued)*

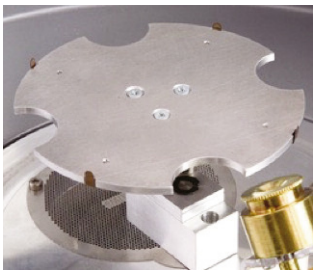
### ORDERING INFORMATION (continued)



Microscope slide stage



Rotation stage



Wafer stage

Rotacota planetary stage

| | | |
|---|---|---|
| **4513** | Glow discharge insert to modify surface properties (e.g. hydrophobic to hydrophilic conversion) or to clean surface residues (TS and T ES only). Can be retrofitted | each |
| **Specimen stages** | | |
| The EMS 150T Plus has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except rotary planetary stage): | | |
| **3330** | Rotation stage, 50 mm Ø (supplied as standard). This stage only rotates – no tilt or height adjustment | each |
| **3340** | Rotate-tilt specimen stage with adjustable tilt (up to 90 degrees) and height (37 mm-60 mm). Tilt angle can be preset. 50 mm Ø specimen platform with six stub positions for 15 mm or 6.5 mm or ⅛" pin stubs. Stage rotation speed variable between 8 and 20rpm | each |
| **3350** | Variable angle "Rotacota" rotary planetary stage with 50 mm Ø specimen platform. Has six stub positions for 15 mm or 6.5 mm or ⅛" pin stubs. Stage rotation speed variable between 8 and 20rpm | each |
| **3360** | Flat rotation specimen stage for 100 mm / 4" wafers, includes gearbox for increased coverage. Stage rotation speed variable between 8 and 20rpm | each |
| **3370** | Rotating specimen stage for glass microscope slides (up to two x 75 mm x 25 mm slides). Stage rotation speed variable between 8 and 20rpm. Includes gear box to allow optional FTM to be used | each |
| **23850** | Tilt stage sub-assembly 4" | each |
| **Evaporation Supplies** | | |
| **73830-SP** | Tungsten wire baskets – pack of 10 | 10/pk |
| **73810-SP** | Molybdenum boats – pack of 10 | 10/pk |
| **Carbon supplies** | | |
| **3500** | Carbon rods – 6.15 mm Ø x 100 mm length (unshaped) pack of 10 | 10/pk |
| **3510** | Carbon rods – 6.15 mm Ø x 50 mm length (shaped) pack of 10 | 10/pk |
| **3520** | Carbon rods – 3.05 mm Ø x 50 mm length (shaped) pack of 10 | 10/pk |
| **3525** | Carbon rods – 3.05 mm Ø x 100 mm length (unshaped) pack of 10 | 10/pk |
| **3530** | Carbon rods 3.05 mm Ø x 300 mm length (unshaped) pack of 10 | 10/pk |
| **3540** | Carbon fiber cord – high purity – 1m | each |
| **3550** | Carbon fiber cord – high purity – 5m | each |
| **3560** | Carbon fiber cord – standard grade – 1m | each |
| **3570** | Carbon fiber cord – standard grade – 10m | each |
| **3580** | Carbon fiber cord – standard grade – 100m | each |
| **3590** | Manual rod shaper for 6.15 mm Ø carbon rods | each |
| **3595** | Manual rod shaper for 3.05 mm Ø carbon rods | each |
| **12097** | Wedge Tool | each |
| **Sputtering Targets** | | |
| **3410** | 57 mm Ø x 0.1 mm Gold | each |
| **3410-2** | 57 mm Ø x 0.2 mm Gold | each |
| **3411** | 57 mm Ø x 0.1 mm Gold/Palladium (80/20) | each |
| **3411-2** | 57 mm Ø x 0.2 mm Gold/Palladium (80/20) | each |
| **3412** | 57 mm Ø x 0.1 mm Platinum | each |
| **3413** | 57 mm Ø x 0.1 mm Nickel | each |
| **3414** | 57 mm Ø x 0.1 mm Silver | each |
| **3415** | 57 mm Ø x 0.1 mm Palladium | each |
| **3416** | 57 mm Ø x 0.1 mm Copper | each |
| **3417** | 57 mm Ø x 0.3 mm Chromium | each |
| **3418** | 57 mm Ø x 0.5 mm Tungsten | each |
| **3419** | 57 mm Ø x 1.5 mm Chromium | each |
| **3420** | 57 mm Ø x 0.2 mm Tungsten | each |
| **3421** | 54 mm Ø x 1.5 mm Carbon | each |
| **3422** | 57 mm Ø x 0.1 mm Aluminum | each |
| **3423** | 57 mm Ø x 0.1 mm Platinum/Palladium (80/20) | each |
| **3424** | 57 mm Ø x 1.5 mm Titanium | each |
| **3425** | 57 mm Ø x 0.3 mm Platinum/Palladium (80/20) | each |
| **3426** | 57 mm Ø x 0.3 mm Gold | each |
| **3427** | 57 mm Ø x 0.3 mm Gold/Palladium (80/20) | each |
| **3428** | 57 mm Ø x 0.3 mm Platinum | each |
| **3429** | 57 mm Ø x 0.5 mm Titanium | each |
| **3430** | 57 mm Ø x 0.1 mm Iron | each |
| **3431** | 57 mm Ø x 0.3 mm Iridium | each |
| **3432** | 57 mm Ø x 0.1 mm Cobalt | each |
| **3433** | 57 mm Ø x 0.1 mm Tin | each |
| **3434** | 57 mm Ø x 0.1 mm Molybdenum | each |
| **3435** | 57 mm Ø x 0.3 mm Magnesium | each |
| **3436** | 57 mm Ø x 0.1 mm Tantalum | each |
| **3437** | 57 mm Ø x 3 mm Indium Tin Oxide (90/10) | each |
| **Other consumables and spare kits** | | |
| **3600** | Metal evaporation basket – pack of 10 (for use with metal evaporation head) | 10/pk |
| **07803** | Basic Oil Mist Filter (spare) | each |
| **13233** | Rotary Pump Oil (spare), 1L | each |
| **13235** | Rotary Pump Oil (spare), 5L | each |
| **27607** | Non-seal L Gasket | each |
| **G6260** | Glass cylinder 6" | each |
| **10068** | AdditionalÂ glass cylinder assembly | each |
| **10429** | ExtendedÂ glass cylinder assembly | each |
| **3610** | Two-year spares kit for EMS 150V S Plus Includes: chromium (Cr) target, glass cylinder, carbon fiber cord, quartz crystals, O-rings | kit |
| **3620** | Two-year spares kit for EMS 150V E Plus Includes: chromium (Cr) target, glass cylinder, carbon fiber cord, carbon fiber – fine, carbon rods 3.05 mm, quartz crystals, O-rings | kit |
| **3630** | Two-year spares kit for EMS 150V ES Plus Includes: chromium (Cr) target, glass cylinder, carbon fiber cord, carbon fiber – fine, carbon rods 3.05 mm, quartz crystals, O-rings | kit |

# EMS150GB Turbo-Pumped Sputter Coater/ Carbon Coater — For Glove Box

## Quick Overview

The EMS150GB is a modular glove box version of the highly successful EMS150T ES bench top turbomolecular-pumped coating system - suitable for SEM, TEM and many thin-film applications. The EMS150GB comes as standard with sputtering and carbon rod evaporation inserts and a rotating specimen stage. Options include a metal evaporation insert, glow discharge, a film thickness monitor (FTM), aperture cleaning insert and special stages to suit a range of specimen types.

## Key Features

- Modular construction for mounting in glove boxes
- Integral glove box pressure monitoring
- Remote operation from a touch screen control panel
- Metal sputtering and carbon evaporation in one system
- Fine grain sputtering for advanced high resolution FE-SEM applications
- High vacuum turbo pumping - allows sputtering of a wide range oxidising and non-oxidising metals
- High vacuum carbon rod coating - ideal for SEM and TEM carbon coating applications (carbon fibre available as an option)
- Advanced "anti-stick" carbon rod evaporation gun – simple operation, reproducible results
- Control of evaporation current profile - ensures consistently reproducible carbon films
- Precise thickness control using the film thickness monitor option
- Fully automatic touch screen control – rapid data input, simple operation
- Multiple, customer defined coating schedules can be stored - ideal for multi-user laboratories
- Automatic vacuum control which can be pre-programmed to suit the process and material – no manual needle valve to adjust
- "Intelligent" recognition of system - automatically detects the type of coating insert fitted
- Easy-to-change, drop-in style specimen stages (flat rotation stage as standard)
- Vacuum shut down feature - leaves the process chamber under vacuum when not in use - improved vacuum performance
- Thick film capabilities - up to 60 minutes sputtering time without breaking vacuum
- Power Factor Correction - complies with the current legislation (CE certification) - efficient use of power means reduced running costs
- Three-year warranty

## Product Description

The EMS150GB is single platform for sputtering and carbon rod evaporation. Metal evaporation using filament or boat sources is possible using an optional insert.

Depending upon user preference, the EMS150GB can be a top-of-the-range sputter coater for high resolution scanning electron microscopy (SEM), or a high vacuum carbon coater suitable for SEM and transmission electron microscopy (TEM). The flexibility of the system can be further expanded using a range of optional accessories.

The EMS150GB can rapidly sputter a wide selection of oxidising and non-oxidising metals making it ideal for many thin film applications.

The EMS150GB has an integral turbomolecular pump and additionally requires a suitable rotary pump or dry pump to "back" the turbomolecular pump (see Option and Accessories).

### Flexible modular design

A modular design enables the vacuum chamber to be mounted through the base of the glove box or - when modification to the glove box floor is not possible - inside the glove box (optional feedthroughs are required).

A separate power supply housed in a rugged case is designed to be floor mounted and can be positioned conveniently beneath the glove box or bench. The touch screen user interface is housed in a robust stainless steel case and can be positioned outside of the glove box environment, if preferred.

*EMS150GB mounted in a glove box*

## Options for glove box mounting:

**Vacuum module mounted in the floor of the glove box**

A cut-out is made in the floor of the glove box and the vacuum chamber fitted and sealed with the gasket supplied. External connections from the floor mounted power supply, vacuum pump and argon gas can then be made directly to the chamber.

**OR**

**Vacuum module placed inside the glove box**

The chamber assembly is placed inside the glove box and the power supply, vacuum pump and argon gas connections are made through two KF40 feedthroughs in the rear of the glove box.

Note: each EMS150GB is supplied with an accessory/configuration kit to suit either internally or externally mounted vacuum chambers. Additional kits can be designed on a case-by-case basis to allow the system to be adapted to various manufacturers' glove boxes. *Please contact EMS for more details.*



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Fax (215) 412-8450 or 8452 • email: info@emsdiasum.com or stacie@ems-secure.com • www.emsdiasum.com

## EMS150GB Turbo-Pumped Sputter Coater/Carbon Coater — For Glove Box (continued)

### Touch screen user interface

Enclosed in a stainless steel case and mounted at a convenient position outside the glove box, the touch screen allows multiple users to input and store coating protocols.


*Touch screen control module*

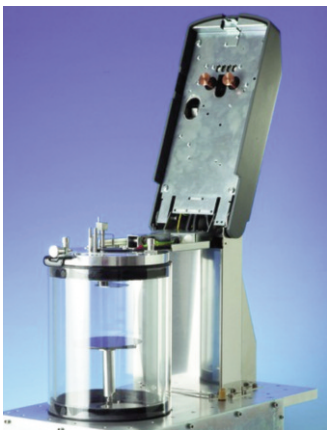
Vacuum module - including "vacuum shutdown" and glove box pressure interlock

The vacuum module houses all the working components, including the efficient 70L/s air-cooled turbomolecular pump. An automatic bleed control ensures optimum vacuum conditions during sputtering and a full range active gauge is fitted as standard to monitor the vacuum.

The EMS150GB includes "vacuum shutdown", a convenient feature which enhances vacuum performance by allowing the chamber vacuum to be maintained when the coater is not in use.

A unique feature of the EMS150GB is the integral pressure interlock switch. This independently monitors the pressure inside the glove box and shuts off the vacuum pump if the glove box atmosphere is unacceptably reduced due to a vacuum leak.

The vacuum chamber is 214mm high to allow for increased source to substrate distances required for coating large specimens. It has an external diameter of 165mm and comes with an integral implosion guard. The chamber assembly is easily removed to allow specimen exchange and chamber cleaning.



*Vacuum chamber assembly*

A variable speed rotary specimen stage is fitted as standard, with full height adjustment from 0 to 190mm above the base plate; other stages are available as options.

Sputter coating and carbon coating as standard, plus an option for metal evaporation

### "Intelligent" Quick-change deposition inserts

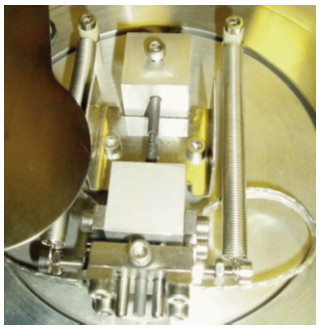
The deposition inserts can be swapped in seconds and the intelligent system logic automatically recognises which insert is in place and displays the appropriate operating settings.

### High resolution sputter coating

The EMS150GB features a high-resolution sputter coater insert (3200) for oxidising and non-oxidising (noble) metals. A wide selection of sputtering targets is available, including iridium and chromium, which are highly recommended for FE-SEM applications. Please see Options and Accessories for details of available metal targets.

### Carbon rod evaporation

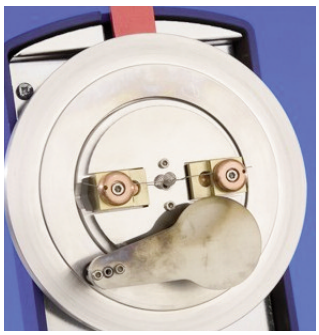
The high vacuum carbon rod coating insert (3230) is ideal for the production of highly stable carbon films and surface replicas for transmission electron microscopy (TEM). The system uses economical 3.05mm diameter carbon rods and the advanced "anti-stick" carbon rod evaporation gun offers simple operation and reproducible results. A carbon fibre evaporation insert (3250) is available as an option (see Options and Accessories).



*Carbon rod evaporation insert*

### Metal evaporation/ aperture cleaning option

A quick change insert (3260) allows metal evaporation from tungsten baskets or molybedenum boats - ideal for thin film applications. For ease of set up in a glove box, the metal charge can be loaded into the evaporation source away from the vacuum chamber.

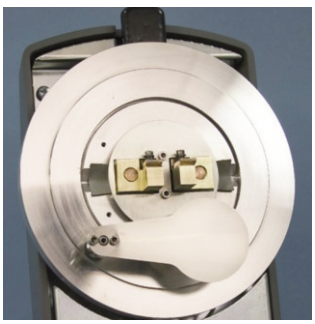


*Metal evaporation insert option*

Each of the above configurations can be used with a range of optional accessories. See options and Accessories for details.

### Rapid data entry

At the operational heart of EMS150GB is a simple colour touch screen, which allows even the most inexperienced or occasional operators to rapidly enter and store their own process data. To further aid ease of use a number of typical sputtering and evaporation profiles are provided.



*Carbon fibre evaporation insert option*

### Additional Information

**Options and Accessories** (including details the standard specimen stage)

Coating inserts included with the EMS150GB

A range of interchangeable, plug-in style coating head inserts are available:

- Sputtering head insert (3200) is suitable for oxidising and non-oxidising metals. Supplied with a 54mm Ø x 0.3mm thick chromium target (3417) as standard. For additional targets see "Ordering Information" section.

Note: changing sputtering targets is easy, but additional sputter head inserts can be purchased for even quicker coating material change - see (3210)

- Carbon rod evaporation head insert and accessories for 3.05mm Ø rods (3230)

**Optional coating inserts**

**Carbon rod evaporation head insert for 6.15mm Ø rods (3240)**.
Note that EMS recommends 3.05mm Ø rods as they offer greater process control and are more economical (less wastage)

continued > > > >

Quorum

# EQUIPMENT & ACCESSORIES

## EMS150GB Turbo-Pumped Sputter Coater/Carbon Coater — For Glove Box (continued)

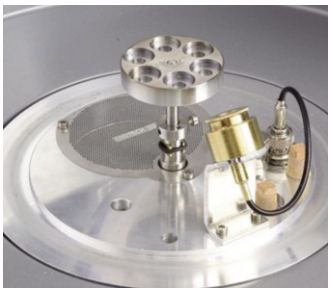
- Carbon fibre evaporation head insert (3250)
- Metal evaporation and aperture cleaning head insert (3260), using tungsten wire baskets and molybdenum boats. Includes electrode extensions to allow upwards evaporation, if required. Note: when the electrodes are fitted some stage options cannot be used

**Specimen stages**

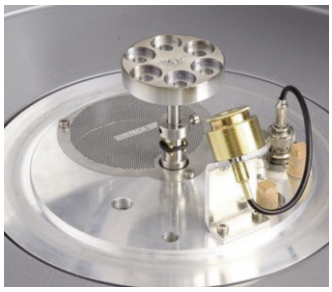
The EMS150GB has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except rotary planetary stage).

- 6800-S rotation stage, 50mm Ø (supplied as standard). This stage only rotates – no tilt or height adjustment.
- 6801 rotate-tilt stage, 50mm Ø with height adjustment (target to stage height variable between 37mm and 60mm). The tilt angle can be pre-set.
- 6803 variable angle 'Rota-Cota' rotary planetary specimen stage with 50mm Ø specimen platform with six stub positions for 15mm or 6.5mm or 1/8" pin stubs.
- 3360 flat rotation stage for 4"/100mm wafers. Includes gear box which needs to be fitted when the optional FTM is being used or for coating over the full area of the stage.
- 6804 rotation stage for glass microscope slides. Allows two 75 x 25mm slides to be coated.

*Note: all rotation stages have rotation speeds that can be variable between 8 and 20 rpm.*



*4" wafer stage option*



*standard rotating specimen stage and optional film thickness monitor (FTM)*

## SPECIFICATIONS

| | |
|---|---|
| Vacuum module size | 267mm W x 490mm D x 494mm H (total height with coating head open: 767mm) |
| Power supply size | 310mm W x 357mm D x 262mm H |
| User interface size & weight | 160mm W x 157mm D x 42mm. |
| Weight: | 40kg |
| Packed dimensions | 725mm W x 660mm D x 787mm H (44kg) |
| Work chamber | Borosilicate glass 152mm Ø (inside) x 214mm H |
| Safety shield | Integral polyethylene terephthalate (PET) cylinder |
| Display | 145mm 320 x 240 colour graphic TFT (Thin Film Transistor) display |
| User interface | Intuitive full graphical interface with touch screen buttons, includes features such as a log of the last 100 coatings carried out and reminders for when maintenance is due |
| Sputtering target | Disc style 57mm Ø x 0.3mm thick chromium target is fitted as standard |
| Specimen stage | 60mm Ø rotation stage. Rotation speed 8 ~ 20 rpm |
| For alternative stages see Options and Acessories | |
| Specimen shutter | An automatic shutter is fitted as standard to shield specimens during pre-sputtering of oxidising metals and protection during evaporation outgassing procedures |

### Vacuum

| | |
|---|---|
| Turbomolecular pump | Internally mounted, 70L/s air-cooled turbomolecular pump |
| Rotary pump | 5m3/hr-1 two-stage rotary pump with oil mist filter (order separately: 91003) |
| Vacuum measurement | An active full-range gauge is fitted |
| Typical ultimate vacuum | $5x10^{-5}$mbar |
| Sputter vacuum range | Between $5x10^{-3}$ and $5x10^{-1}$mbar |

### Interlocks

The EMS150GB is interlocked to prevent continuous pumping of the glove box in the event of a vacuum leak

### Processes

Sputtering 0-150mA to a pre-determined thickness (with optional FTM) or by the built-in timer. The maximium sputtering time is 60 minutes (without "breaking" vacuum and with built-in rest periods)

Carbon evaporation A robust, ripple free, D.C. power supply featuring pulse evaporation ensures reproducible carbon evaporation from rod or fibre sources. Current pulse: 1-90A

Metal evaporation and aperture cleaning insert (option) For thermal evaporation of metals from filaments or molybdenum boat can be fitted. The metal evaporation head is set up for downwards evaporation, but upward evaporation can be achieved by fitting two terminal extensions (supplied). Evaporation times: up to four minutes

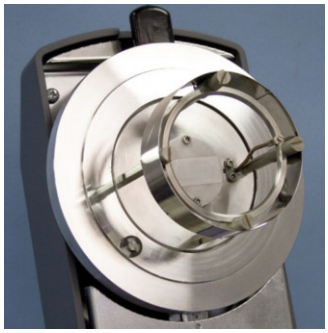
### Services and other information

| | |
|---|---|
| Gases | Quick-connect inlet for: argon sputtering process gas, 99.999% ("zero grade") |
| Nitrogen venting gas (no quick-connect – uses the glove box atmosphere as the source | |
| Electrical supply | 90-250V ~ 50/60 Hz 1400 VA including rotary pump power. 110/240V voltage selectable |
| Conformity | CE conformity: Power Factor Correction. Complies with the current legislation (CE Certification) and ensures efficient use of power which means reduced running costs |

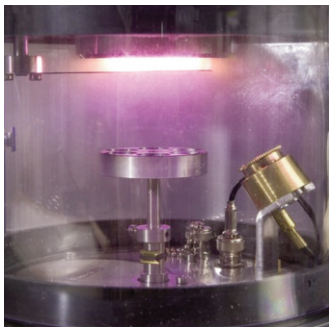
## EMS150GB Turbo-Pumped Sputter Coater/Carbon Coater — For Glove Box (continued)

**Other options, including FTM and glow discharge**

- 3270 extended height chamber (87mm higher than the standard stage) For tall specimens.
- 3290 Film Thickness Monitor (FTM). Consists of a controller and quartz crystal oscillator built into the EMS150GB and a vacuum feed though, chamber mounted crystal holder and quartz crystal. As sputtered or evaporated material is deposited onto the crystal, so its frequency of oscillation is modified. This 'modification' is used to measure and control the thickness of material deposited.
- 4513 glow discharge insert. Used to modify surface properties (eg hydrophobic to hydrophilic conversion).



*Glow discharge attachment option*



*During sputtering, optional film thickness monitor (FTM) shown*

## ORDERING INFORMATION

**EMS150GB** A modular, high resolution turbomolecular-pumped sputter coater/carbon rod evaporator for glove boxes. **Includes:** sputtering insert, 54mm Ø x 0.3mm chromium target, carbon rod evaporation insert, carbon rods (3.05mm Ø x 300mm) and carbon rod shaper (manual operation). Fitted with a rotation stage — each

### Rotary pump requirements (needs to be ordered separately)

**91003** Edwards RV3 50L/s two-stage rotary pump, with vacuum hose, coupling kit and oil mist filter — each

**6550** Diaphragm pump. A "dry" alternative to the standard 91003 oil-based rotary pump complete with vacuum hose, coupling kit and oil mist filter — each

### Options and accessories

**3230** Carbon rod evaporation head insert (for 3.05mm Ø rods — each

**3240** Carbon rod evaporation head insert (for 6.15mm Ø rods). — each

Note that EMS recommends 3.05mm Ø rods as they offer greater process control and are more economical

**3250** Carbon fiber evaporation head insert — each

**3260** Metal evaporation and aperture cleaning head insert, including the ability to evaporate upwards or downwards. Supplied with a pack of ten tungsten filaments and a molybdenum boat. — each

**3270** Extended height vacuum chamber (214mm high – the standard chamber is 127mm high). For increased source to sample distance and for coating large specimens — each

**3290** Film thickness monitor (FTM) attachment. Consists of a built in chamber mounted quartz crystal oscillator (includes crystal). As sputtered or evaporated material is deposited onto the crystal, so its frequency of oscillation is modified. This 'modification' is used to measure and control the thickness of material deposited — each

**3300** Spare quartz crystal. — each

**3320** Full range vacuum gauge for low and high vacuum measurement (a low vacuum Pirani gauge is fitted as standard) — each

**4513** Glow discharge insert to modify surface properties (eg hydrophobic to hydrophilic conversion) or to clean surface residues — each

**3600** Metal evaporation basket - pack of 10 (for use with metal evaporation head) — each

**3630** Two-year spares kit for EMS150GB — each

**Includes:** chromium target, glass cylinder, carbon fibre cord, carbon fibre - fine, carbon rods 3.05mm, quartz crystals, O-rings — each

### Specimen stages

**6790-S** Swinging arm stage drive, a stage drive and positioning mechanism which positions the stage under the correct target. Also provides rotation drive to the stage. Rotation Speed Max 38 rpm Min 14 rpm — each

**6800-S** Rotating specimen stage for 6" (152 mm) wafers, with rotation variable between preset limits. — each

**6801** Rotating 50 mm Ø specimen stage with adjustable tilt. — each
The platform has six specimen stub positions for 15 mm, 10 mm, 6.5 mm or 1/8" pin stubs.
The stage rotation speed is variable between preset limits.
The target to stage height is variable between 0 mm and 42 mm for the standard stage.
When used with the extended height cylinder the target to stage height would be an additional 87 mm.

**6802** 50 mm Ø variable height specimen stage with six stub positions for 15 mm, 10 mm, 6.5 mm disc stubs or 1/8" pin stubs. Stage rotation speed variable between preset limits. — each

***Note:*** *Target to stage height is variable between 10 mm and 53 mm for the standard stage. The stage is supplied with two mounting pillars; one provides 10 mm to 32 mm target to stage distance and the other 31 mm to 53 mm. An adjustable stop is used to set the height. When used with the extended height cylinder (optional accessory) the target to stage height would be an additional 87 mm.*

**6803** 50 mm Ø rotary tilting stage. — each
A rotary planetary style stage with a variable tilt angle from horizontal to 30 degrees. The platform has six positions for either 6.5 mm, 10 mm and 15 mm disc stubs or 1/8" pin stubs. Rotation speed is variable between preset limits.

***Note:*** *depending upon specimen height, this stage may require the optional extended height cylinder.*

**6804** A 90 mm Ø specimen stage for glass microscope slides (up to two 75 mm x 25 mm slides or a single 75 mm x 50 mm slide). — each
The stage can alternatively accommodate up to six 1/8" SEM pin stubs. The stage rotation speed is variable between preset limits. A gear box is included to allow the optional FTM to be used.

# EMS 300T T Plus Triple Target, Large Chamber, Turbo-Pumped Sputter Coater


## QUICK OVERVIEW

The EMS300T T Plus is a large chamber, turbo-pumped coating system, ideally suited for sputtering a single large diameter specimen up to 8"/200mm or multiple smaller specimens over a similar diameter. Ideal for thin-film applications and SEM/FE-SEM. It is fitted with three sputtering heads to ensure even deposition of individual large specimens or multiple specimens.

*Please note it is not possible to sequentially sputter three different sputtering metals from each sputtering head. For sequential coating, see the EMS300T D Plus.*

## KEY FEATURES

- **Ultimate vacuum of 1x10$^{-6}$mbar or less possible**
- **New touch and swipe capacitive screen**
- **USB port for upgrades and download of process log files**
- **Multiple-use profiles can be set up on one machine**
- **New software sorts recipes per user according to recent use**
- **16GB of memory can store more than 1000 recipes**
- **New multi-color LED visual status indicator**
- **Interchangeable stage options**
- **Three sputter heads for larger area deposition of different materials**

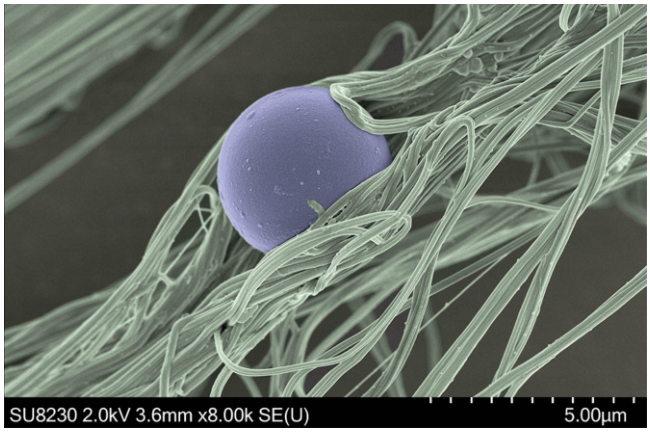
## PRODUCT DESCRIPTION

### Detachable chamber with built-in implosion guard

Removable glass chamber and easily accessible base and top plate allows for an easy cleaning process. Users can rapidly change the chamber, if necessary, to avoid cross contamination of sensitive samples. Tall chamber option is available for improved uniformity for sputtering and to hold larger substrates.

### Triple Target Sputtering System

The EMS 300T T Plus is fitted with three individual sputtering heads to ensure even deposition of individual large specimens or multiple specimens. For economical coating of small specimens, 'single target' mode can be selected. They are ideal coaters for the preparation of large specimens for examination by SEM, FEG-SEM. To ensure even deposition, the EMS 300T T Plus coaters are fitted with a rotating specimen stage and three individual magnetron target assemblies, which enhance the efficiency of the process by using low voltages.




Algae spore in spider web, spore size 5 µm coated with 2nm Cr followed by 1nm Au mag x 8k

### Recommended applications for EMS300T T Plus:

- **Wafer Inspection**
- **Multiple sample preparation for SEM**

***These products are for Research Use Only.***

### Multiple stage options

The EMS 300T T Plus has specimen stages to meet most requirements. All are easy-change, drop-in style (no screws) and the rotation speed is variable between pre-set limits. Flat rotation stage for 200 mm/8" and 150 mm/6" wafers (fitted as standard).

### Safety

The EMS 300T T Plus meets key industry CE standards

- All electronic components are protected by covers
- Implosion guard prevents user injury in event of chamber failure
- Vacuum interlocks remove power from deposition sources to prevent user exposure to high voltage in event of chamber being opened
- Overheating protection shuts down power supply

### Vacuum control

High vacuum turbo pumping allows sputtering of a wide range of oxidizing and non-oxidizing metals for thin film and electron microscopy applications. Automatic vacuum control which can be pre-programmed to suit the process and material, therefore removing the need for manual intervention or control.

## EMS300T T Plus *(continued)*

### Cool magnetron sputtering

Sputter coating is a technique widely used in various applications; it is possible to create a plasma and sputter metals with high voltage, poor vacuum and no automation. However, this is not suitable for electron microscopy applications because it can heat the sample and result in damage when the plasma interacts with the sample. The EMS 300T T Plus uses low temperature enhanced-plasma magnetrons optimized for the turbomolecular pump pressures, combined with low current and deposition control, which ensures your sample is protected and uniformly coated.

The EMS 300T T Plus uses easy-change, 57 mm diameter, disc-style targets which are designed to sputter oxidizing and noble metals. The EMS 300T T Plus is fitted as standard with a chromium (Cr) sputter target. Other targets options include; Au, Au/Pd, Pt/Pd, Pd, Pt, Cu, Ir, W, ITO and Al, etc.

### Pulsed cleaning for aluminum sputtering

Aluminum (Al) rapidly forms an oxide layer which can be difficult to remove. The EMS 300T T Plus has a special recipe for Aluminum that reduces the oxide removal time and prevents excessive pre-sputtering of the target.

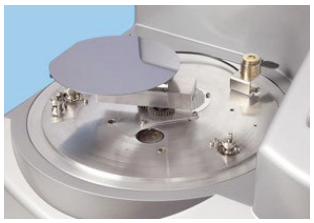
### Film thickness monitor

The EMS 300T T Plus can be fitted with an optional film thickness monitor (FTM), which measures the coating thickness on a quartz crystal monitor within the chamber, in order to control the coating thickness of material deposited on to the sample.

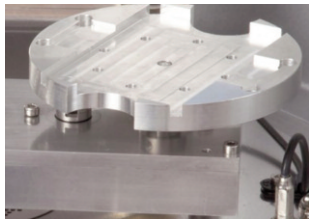
Triple sputtering head with automatic shutter open

Triple sputtering head with automatic shutter closed

rotary planetary specimen stage (option)



Standard specimen stage



Specimen stage for glass microscope slides (option)

## SPECIFICATIONS

| | |
|---|---|
| **Instrument Case** | 590mm W x 535mm D x 420mm H (maximum height during the opening of the coating head: 772mm) |
| **Weight** | 36 kg (packed: 59kg) |
| **Packed Dimensions** | 730 mm W x 630 mm D x 690 mm H |
| **Work Chamber** | Borosilicate glass with integral PET implosion guard Size 300 mm outside diameter x 127 mm High |
| **Display** | 115.5mm W x 86.4mm H (active area), 640 RGB x 480 (display format), capacitive touch color display |
| **User Interface** | Full graphical interface with touch screen buttons, includes features such as a log of the last 1000 coatings and reminders for when maintenance is due |

### Specimen Stage

A flat rotation stage for 6"(150mm) and 8" (200mm) wafers is fitted as standard.

A rotating/tilt stage and the 'rota cota' rotary tilt stage are also options

### Vacuum

| | |
|---|---|
| **Rotary Pump** | 4 $m^3$/hr, two stage rotary pump with oil mist filter for the 300T T Plus |
| **Turbo Pump** | Internally mounted 70L/sec air cooled |
| **Vacuum Measurement** | Pirani gauge as standard, full range gauge available as an option |
| **Ultimate Vacuum** | 5 x $10^{-5}$mbar* |
| **Sputter Vacuum Range** | 5x$10^{-2}$ to 5x$10^{-3}$ mbar* |

*Typical ultimate vacuum of the pumping system in a clean instrument after pre-pumping and venting with dry nitrogen gas

### Processes

| | |
|---|---|
| **Sputter Deposition Current** | Single target: 1 - 140mA<br>All targets: 60 - 420mA |
| **Visual Status Indicator** | A large status multi-color indicator light provides a visual indication of the state of the equipment, allowing users to easily identify the status of a process at distance. |

The indicator LED shows the following states:

- Initialization
- Process running
- Idle
- Coating in progress
- Process completed
- Process ended in fault condition

Audio indication also sounds on completion of the process.

### Services

| | |
|---|---|
| **Gases** | process gas argon, 99.999% Nominal 5 psi |

continued ››››

Quorum **EQUIPMENT & ACCESSORIES**

## EMS300T T Plus *(continued)*

### ORDERING INFORMATION

**EMS 300T T Plus**

| | | |
|---|---|---|
| | Triple Target, Large Chamber, Turbo-Pumped Sputter Coater, fitted with three sputtering heads to ensure even metal deposition. Includes three 57 mm Ø x 0.3 mm chromium (Cr) sputter targets. A flat rotation stage for 200 mm/8" and 150 mm/6" wafers is fitted as standard. | each |

**Rotary pump requirements (needs to be ordered separately)**

| | | |
|---|---|---|
| **91003** | Edwards RV3 50L/s two-stage rotary pump, with vacuum hose, coupling kit and oil mist filter | each |
| **6548** | XDS 5 Scroll Pump | each |
| **6550-A** | Diaphragm pump. A "dry" alternative to the standard 91003 oil-based rotary pump complete with vacuum hose, coupling kit and oil mist filter | each |

**Specimen stages**

| | | |
|---|---|---|
| **6551** | Rotating 50 mm Ø specimen stage with adjustable tilt. The platform has six specimen stub positions for 15 mm, 10 mm, 6.5 mm or 1/8" pin stubs. Stage rotation speed is variable between preset limits. No rotation when in single target mode. Target to stage height is variable between zero and 42 mm for the standard stage. When used with the extended height cylinder (optional accessory) the target to stage height would be an additional 87 mm | each |
| **6552** | 50 mm Ø variable height specimen stage with six stub positions for 15 mm, 10 mm, 6.5 mm disc stubs or 1/8" pin stubs. Stage rotation speed variable between preset limits | each |
| **6553** | 50 mm Ø rotary tilting stage. A rotary planetary style stage with variable tilt angle from horizontal to 30 degrees. The platform has six positions for either, 6.5 mm, 10 mm, 15 mm disc stubs, or 1/8" pin stubs. Rotation speed is variable between preset limits. Note: depending upon specimen height, this stage may require the optional extended height cylinder | each |
| **6554** | A 90 mm Ø specimen stage for glass microscope slides (up to two 75 mm x 25 mm slides or a single 75 mm x 50 mm slide). The stage can alternatively accommodate up to six ⊠" SEM pins stub. Stage rotation speed is variable between preset limits. Includes gear box to allow optional FTM to be used. | each |
| **6547** | 6" Wafer Specimen Stage: A flat adjustable stage capable of accepting 6" or 101.6 mm wafers | each |
| **6549** | A 4" 102 mm flat drop-in-wafer stage which accepts 2", 3", and 4" wafers | each |

**Options and Accessories**

| | | |
|---|---|---|
| **6555** | Film thickness monitor (FTM) attachment. Including oscillator, feed-through, quartz crystal holder and one quartz crystal | each |
| **6556** | Spare quartz crystal | each |
| **6557** | Extended height vacuum chamber (214 mm in height – the standard chamber is 127 mm high). For increased source to specimen distance and for coating large specimens | each |
| **6558** | A lockable emergency stop (e-stop) switch which can be mounted on top of the system in a position easily accessible for the operator. It is provided with a key to release the knob after activation. Note: the addition of the e-stop does not inhibit or replace the normal On/Off switch function. The e-stop can be retrofitted to existing systems | each |
| **6559** | Coating shields. Shields can be fitted to protect large surfaces from coating deposition – easily removable for ease of cleaning | each |
| **6560-A** | Vacuum spigot allows more convenient connection of the vacuum hose to the rear of the EMS 300T T Plus when bench depth is limited | each |
| **6561** | Full range, active vacuum gauge capable of measurement over the range of 1000 mbar to 5 x $10^{-9}$ mbar. Typical ultimate vacuum of system is 5 x 10-5 mbar. Note: gauge must be factory fitted | each |
| **6562** | Spares kit, including: spare standard glass cylinder, three 3417 chromium (Cr) sputtering targets, vacuum tubing with coupling insert, argon gas tubing, three sputter head magnets, rotary pump oil mist filter and fuses | each |

**Sputter targets**

Note: The EMS 300T T Plus is fitted as standard with three 0.3 mm chromium (Cr) targets (3417). Other optional targets are available (three required):

| | | |
|---|---|---|
| **3410** | 57mm Ø x 0.1mm Gold | each |
| **3411** | 57mm Ø x 0.1mm Gold/Palladium (80/20) | each |
| **3412** | 57mm Ø x 0.1mm Platinum | each |
| **3413** | 57mm Ø x 0.1mm Nickel | each |
| **3414** | 57mm Ø x 0.1mm Silver | each |
| **3415** | 57mm Ø x 0.1mm Palladium | each |
| **3416** | 57mm Ø x 0.1mm Copper | each |
| **3417** | 57mm Ø x 0.3mm Chromium | each |
| **3418** | 57mm Ø x 0.5mm Tungsten | each |
| **3419** | 57mm Ø x 1.5mm Chromium | each |
| **3420** | 57mm Ø x 0.2mm Tungsten | each |
| **3421** | 54mm Ø x 1.5mm Carbon | each |
| **3422** | 57mm Ø x 0.1mm Aluminium | each |
| **3423** | 57mm Ø x 0.1mm Platinum/Palladium (80/20) | each |
| **3424** | 57mm Ø x 1.5mm Titanium | each |
| **3425** | 57mm Ø x 0.3mm Platinum/Palladium (80/20) | each |
| **3426** | 57mm Ø x 0.3mm Gold | each |
| **3427** | 57mm Ø x 0.3mm Gold/Palladium (80/20) | each |
| **3428** | 57mm Ø x 0.3mm Platinum | each |
| **3429** | 57mm Ø x 0.5mm Titanium | each |
| **3430** | 57mm Ø x 0.1mm Ironeach | each |
| **3431** | 57mm Ø x 0.3mm Iridium | each |
| **3432** | 57mm Ø x 0.1mm Cobalt | each |
| **3433** | 57mm Ø x 0.1mm Tin | each |
| **3434** | 57mm Ø x 0.1mm Molybdenum | each |
| **3435** | 57mm Ø x 0.3mm Magnesium | each |
| **3436** | 57mm Ø x 0.1mm Tantalum | each |
| **3437** | 57mm Ø x 3mm Indium Tin Oxide (90/10) | each |



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# EMS 300T D Plus Dual Target Sequential Sputtering System

## QUICK OVERVIEW

Suitable for multi-layer sequential sputtering of two materials, the EMS300T D Plus has two independent sputtering heads, which allows sequential sputtering of two metals without the need to break vacuum. The system is fully automated with user defined recipes controlling the pumping sequence, time, number of sputter cycles, and the current used during the process. Unlimited layers of varying thickness from two target materials can be sputtered sequentially by cycling between both targets. When not in use the targets are shuttered for protection from contamination.

## KEY FEATURES

- **Capable of achieving vacuum of 5 x $10^{-5}$ mbar**
- **New touch and swipe capacitive screen**
- **USB port for upgrades and download of process log files**
- **Multiple-user profiles can be set up on one machine**
- **New software sorts recipes per user according to recent use**
- **16GB of memory can store more than 1000 recipes**
- **New multi-color LED visual status indicator**
- **Interchangeable stage options**
- **Three sputter heads for large area deposition of different materials**
- **Single head selection for small samples**

### Recommended applications for EMS300T D Plus:

- **Ideal for multi-layer coating**
- **Adhesion studies**

***These products are for Research Use Only.***

## PRODUCT DESCRIPTION

### Improved Interface

- Dual-core ARM processor for a fast, responsive display
- Capacitive touch screen is more sensitive for ease of use
- User interface software has been extensively revised, using a modern smartphone-style interface
- Comprehensive context-sensitive help
- USB interface allows easy software updates and backing up/copying of recipe files to USB stick
- Process log files can be exported via USB port in .csv format for analysis in Excel or similar. Log files include date, time and process parameters.
- 16GB of flash memory can store more than 1000 recipes
- Quick and easy creation of process sequences with a simple copy, drag and drop operation

Allows multiple users to input and store coating recipes. New feature to sort recipes per user according to recent use.

System prompts user to confirm target material and it then automatically selects appropriate parameters for that material.

Intuitive software allows the most inexperienced or occasional operator to rapidly enter and store their own process data. For convenience a number of typical sputtering and carbon coating profiles are already stored but also allows the user to create their own.

Software detects failure to achieve vacuum in a set period of time and shuts down the process in case of vacuum leak, which ensures pump protection from overheating.

### Detachable chamber with built-in implosion guard

Removable glass chamber and easily accessible base and top plate allows for an easy cleaning process. Users can rapidly change the chamber, if necessary, to avoid cross contamination of sensitive samples. Tall chamber option is available for improved uniformity for sputtering and to hold larger substrates.

### Dual head sputtering – for sequential sputtering

The EMS 300T D Plus has two independent sputtering heads to allow sequential sputtering of two different metals without the need to 'break' vacuum, for example, a thin 'seeding' layer of chromium (Cr) followed by deposition of gold (Au). An automatic shutter mechanism enables cleaning of oxidizing sputter targets and protects the second target and substrate during coatings. For single metal applications one target can be selected.

### Multiple stage options

The EMS 300T D Plus has substrate stages to meet most requirements. All are easy-change, drop-in style (no screws) and are height adjustable (except the rotary planetary stage). A swinging arm stage drive is supplied as standard, which is a stage drive and positioning mechanism that positions the stage under the correct target. Rotation speed is variable between 14-38 rpm.

In addition a flat, adjustable stage capable of accepting 4" (101.6 mm) wafers is supplied as standard with the EMS 300T D Plus.

As an accessory, a 6" wafer stage is available, which is a flat adjustable stage capable of accepting 6" or 150 mm wafers. The stage includes two masks for improving uniformity of coating.

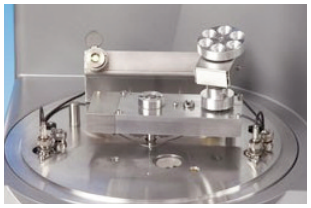
Rotation stage – 50 mm Ø. This stage only rotates and has no tilt or height adjustment.

continued ››››

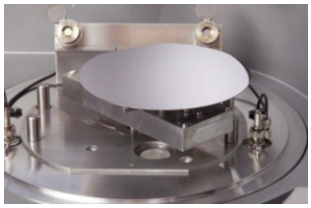
Quorum **EQUIPMENT & ACCESSORIES**

## EMS300T D Plus *(continued)*

Dual sputtering heads and automatic shutter



Rotary planetary stage and dual-channel film thickness monitor - both Q300T D Plus option



Standard rotating specimen stage with 4 wafer and optional dual-channel film thickness monitor

Optional specimen stage for glass microscope slides and dual-channel film thickness monitor

Rotate-tilt stage – 50 mm Ø. With height adjustment (target to stage height variable between 30-80 mm). The tilt angle can be pre-set (horizontal to 30°).

Rotation stage for glass slides – 25 mm x 76 mm

### Safety

The EMS 300T D Plus meets key industry CE standards

- All electronic components are protected by covers
- Implosion guard prevents user injury in event of chamber failure
- Vacuum interlocks remove power from deposition sources to prevent user exposure to high voltage in event of chamber being opened
- Overheating protection shuts down power supply

### Vacuum control

High vacuum turbo pumping allows sputtering of a wide range of oxidizing and non-oxidizing metals for thin film and electron microscopy applications. Automatic vacuum control which can be pre-programmed to suit the process and material, therefore removing the need for manual intervention or control.

### Cool magnetron sputtering

Sputter coating is a technique widely used in various applications; it is possible to create a plasma and sputter metals with high voltage, poor vacuum and no automation. However, this is not suitable for some applications because it can heat the substrate and result in damage when the plasma interacts with the substrate. The EMS 300T D Plus uses low temperature enhanced-plasma magnetrons optimized for the turbomolecular pump pressures, combined with low current and deposition control, which ensures your substrate is protected and uniformly coated.

The EMS 300T D Plus uses easy-change, 57 mm diameter, disc-style targets which are designed to sputter oxidizing and noble metals. It is fitted with gold (Au) and chromium (Cr) sputter targets as standard.

### Pulsed cleaning for Aluminum sputtering

Aluminum (Al) rapidly forms an oxide layer which can be difficult to remove. The EMS 300T D Plus has a special recipe for Aluminum that reduces the oxide removal time and prevents excessive pre-sputtering of the target.

### Film thickness monitor

The EMS 300T D Plus can be fitted with an optional dual film thickness monitor (FTM), which measures the coating thickness on two quartz crystal monitors located within the chamber. The thickness measured on the monitor can be correlated to the thickness on the substrate using a mathematical formula built into the software; this allows the user to control the thickness of material deposited on to the substrate. For example, the EMS 300T D Plus can automatically terminate a coating profile when the required thickness has been achieved. Alternatively, the process can be terminated by time.

## SPECIFICATIONS

| | |
|---|---|
| **Instrument Case** | 590mm W x 535mm D x 420mm H (maximum height during the opening of the coating head: 772mm) |
| **Weight** | 36 kg (packed: 59kg) |
| **Packed Dimensions** | 730 mm W x 630 mm D x 690 mm H |
| **Work Chamber** | Borosilicate glass with integral PET implosion guard Size 300 mm outside diameter x 127 mm High |
| **Display** | 115.5mm W x 86.4mm H (active area), 640 RGB x 480 (display format), capacitive touch color display |
| **User Interface** | Full graphical interface with touch screen buttons, includes features such as a log of the last 1000 coatings and reminders for when maintenance is due |

### Specimen Stage

A flat adjustable stage capable of accepting either 4" or 6" wafers is mounted on a swinging arm stage, which rotates the stage under the targets to optimise coating. Rotation speed is variable from 14rpm to 38rpm

### Vacuum

| | |
|---|---|
| **Rotary Pump** | 50L/min two stage rotary pump with oil mist filter |
| **Turbo Pump** | Internally mounted 70L/sec air cooled |
| **Vacuum Measurement** | Pirani gauge as standard, full range gauge available as an option |
| **Ultimate Vacuum** | 5 x $10^{-5}$mbar* |
| **Sputter Vacuum Range** | 5x$10^{-3}$ to 5x$10^{-2}$ mbar* |

*Typical ultimate vacuum of the pumping system in a clean instrument after pre-pumping and venting with dry nitrogen gas

### Processes

| | |
|---|---|
| **Sputter Deposition Current** | 150 mA |
| **Visual Status Indicator** | A large status multi-color indicator light provides a visual indication of the state of the equipment, allowing users to easily identify the status of a process at distance. |

The indicator LED shows the following states:
• Initialization • Process running • Idle • Coating in progress
• Process completed • Process ended in fault condition
Audio indication also sounds on completion of the process.

### Services

| | |
|---|---|
| **Gases** | process gas argon, 99.999% Nominal 5psi |
| **Vent Gas** | Nitrogen (optional). Nominal 5psi |



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## EMS 300T D Plus *(continued)*

### ORDERING INFORMATION

| | | |
|---|---|---|
| **EMS300T D Plus** | | |
| | Dual Target Sequential Sputtering System; includes a 57 mm Ø x 0.3 mm chromium (Cr) target and a 57 mm Ø x 0.1 mm thick gold (Au) target . A flat rotation stage for 4"/100 mm wafers is included. | each |
| **Rotary pump requirements (needs to be ordered separately)** | | |
| **91003** | Edwards RV3 50L/s two-stage rotary pump, with vacuum hose, coupling kit and oil mist filter | each |
| **6548** | XDS 5 Scroll Pump | each |
| **6550-A** | Diaphragm pump. A "dry" alternative to the standard 91003 oil-based rotary pump complete with vacuum hose, coupling kit and oil mist filter | each |
| **Specimen stages** | | |
| **6790-S** | Swinging arm stage drive, a stage drive and positioning mechanism which positions the stage under the correct target. Also provides rotation drive to the stage. Rotation Speed Max 38 rpm Min 14 rpm | each |
| **6800-S** | Rotating specimen stage for 6" (152 mm) wafers, with rotation variable between preset limits. | each |
| **6801** | Rotating 50 mm Ø specimen stage with adjustable tilt. The platform has six specimen stub positions for 15 mm, 10 mm, 6.5 mm or 1/8" pin stubs. The stage rotation speed is variable between preset limits. The target to stage height is variable between 0 mm and 42 mm for the standard stage. When used with the extended height cylinder the target to stage height would be an additional 87 mm. | each |
| **6802** | 50 mm Ø variable height specimen stage with six stub positions for 15 mm, 10 mm, 6.5 mm disc stubs or 1/8" pin stubs. Stage rotation speed variable between preset limits. Note: Target to stage height is variable between 10 mm and 53 mm for the standard stage. The stage is supplied with two mounting pillars; one provides 10 mm to 32 mm target to stage distance and the other 31 mm to 53 mm. An adjustable stop is used to set the height. When used with the extended height cylinder (optional accessory) the target to stage height would be an additional 87 mm. | each |
| **6803** | 50 mm Ø rotary tilting stage. A rotary planetary style stage with a variable tilt angle from horizontal to 30 degrees. The platform has six positions for either 6.5 mm, 10 mm and 15 mm disc stubs or 1/8" pin stubs. Rotation speed is variable between preset limits. Note: depending upon specimen height, this stage may require the optional extended height cylinder. | each |
| **6804** | A 90 mm Ø specimen stage for glass microscope slides (up to two 75 mm x 25 mm slides or a single 75 mm x 50 mm slide). The stage can alternatively accommodate up to six 1/8" SEM pin stubs. The stage rotation speed is variable between preset limits. A gear box is included to allow the optional FTM to be used. | each |
| **Options and Accessories** | | |
| **6805** | Dual channel film thickness monitor (FTM). A fully integrated system using the EMS300T D Plus touch screen display for the control and display of all FTM functions. The FTM allows for the automatic termination of the metal sputtering process at a pre-selected thickness value. The rate for the sputtering processes is displayed in nm/min, with a resolution of 0.1 nm. Two FTM crystal holders are fixed in the chamber to give optimal position for both targets and to coat one material per crystal. Operating crystal frequency is in the 5 MHz to 400 kHz operating range. Includes two spare quartz crystals | each |
| **6806** | Spare quartz crystal. | each |
| **6807** | Extended height vacuum chamber (214 mm in height, the standard chamber is 127 mm high). Ideal for increased source to specimen distance and for coating of larger specimens. | each |
| **6808** | Vacuum spigot allows more convenient connection of the vacuum hose to the rear of the EMS300T D Plus when bench depth is limited. | each |
| **6809** | A lockable emergency stop (e-stop) switch which can be mounted on top of the system in a position easily accessible for the operator. It is provided with a key to release the knob after activation. Note: the addition of the e-stop does not inhibit or replace the normal On/Off switch function. The e-stop can be retrofitted to existing systems. | each |
| **6810** | Full range, active vacuum gauge capable of measurement over the range of 1000 mbar to 5 x 10-9 mbar. Typical ultimate vacuum of the EMS300T D Plus is 5 x $10^{-5}$ mbar. Note: this must be factory fitted. | each |
| **6811** | Coating shields. Can be fitted to protect large surfaces from coating deposition and can be easily removable for cleaning. | each |
| **6812** | Spares kit, including: spare standard glass cylinder, one chromium (Cr) and one (Au) sputtering target, vacuum tubing with coupling insert, argon gas tubing, two sputter head magnets, rotary pump oil mist filter, FTM quartz crystal and fuses. | each |
| **Sputter targets** | | |
| Note: The EMS 300T T Plus is fitted as standard with three 0.3 mm chromium (Cr) targets (3417). Other optional targets are available (three required): | | |
| **3410** | 57mm Ø x 0.1mm Gold | each |
| **3411** | 57mm Ø x 0.1mm Gold/Palladium (80/20) | each |
| **3412** | 57mm Ø x 0.1mm Platinum | each |
| **3413** | 57mm Ø x 0.1mm Nickel | each |
| **3414** | 57mm Ø x 0.1mm Silver | each |
| **3415** | 57mm Ø x 0.1mm Palladium | each |
| **3416** | 57mm Ø x 0.1mm Copper | each |
| **3417** | 57mm Ø x 0.3mm Chromium | each |
| **3418** | 57mm Ø x 0.5mm Tungsten | each |
| **3419** | 57mm Ø x 1.5mm Chromium | each |
| **3420** | 57mm Ø x 0.2mm Tungsten | each |
| **3421** | 54mm Ø x 1.5mm Carbon | each |
| **3422** | 57mm Ø x 0.1mm Aluminium | each |
| **3423** | 57mm Ø x 0.1mm Platinum/Palladium (80/20) | each |
| **3424** | 57mm Ø x 1.5mm Titanium | each |
| **3425** | 57mm Ø x 0.3mm Platinum/Palladium (80/20) | each |
| **3426** | 57mm Ø x 0.3mm Gold | each |
| **3427** | 57mm Ø x 0.3mm Gold/Palladium (80/20) | each |
| **3428** | 57mm Ø x 0.3mm Platinum | each |
| **3429** | 57mm Ø x 0.5mm Titanium | each |
| **3430** | 57mm Ø x 0.1mm Ironeach | each |
| **3431** | 57mm Ø x 0.3mm Iridium | each |
| **3432** | 57mm Ø x 0.1mm Cobalt | each |
| **3433** | 57mm Ø x 0.1mm Tin | each |
| **3434** | 57mm Ø x 0.1mm Molybdenum | each |
| **3435** | 57mm Ø x 0.3mm Magnesium | each |
| **3436** | 57mm Ø x 0.1mm Tantalum | each |
| **3437** | 57mm Ø x 3mm Indium Tin Oxide (90/10) | each |

Quorum

# EQUIPMENT & ACCESSORIES

## EMS 975 Large Chamber Turbo Evaporator & EMS 975S for Semiconductor Wafer Coating

The EMS 975 Turbo Evaporator is a multiple application system to enable a range of preparation techniques to be applied with the flexibility and module expansion capability to develop new methods and prepare new specimens.

The EMS 975 allows for carbon evaporation, metal evaporation from both baskets and crucibles and sputter coating option. A range of techniques can be practiced including carbon support films and replicas for TEM, carbon/metal evaporation, low angle shadowing and sequential layer coating using dual source evaporation and the sputter option can be used for a range of target materials.

The system flexibility is further enhanced by the use of a microcontroller, which readily allows the customer access to a range of options, but readily 'defaults' to optimum operating conditions, allowing both fully automatic and manual override as required. The unique loading rack out drawer system gives the user easy sample access with good sample size and the hinged lid assembly makes any other areas of the system readily accessible.

The unit has a turbo pump, externally mounted for convenience and easy exchange, and is backed up by a Rotary Vacuum Pump. The complete pumping sequence is under fully automatic control, achieving a high vacuum for evaporation.

The unit is bench mounted, with easy to use controls, and cannot be damaged by inadvertent use.

The EMS-975S is based on the EMS-975, however it has a special load lock door which allows the entry of 8" wafers with carbon coating, or other samples up to 140mm x 140mm square.


### FEATURES

- **Turbomolecular Pump.**
- **Automatic pumping sequence.**
- **Clean vacuum.**
- **Variable outgas control.**
- **Evaporation pulse button.**
- **Unique “anti stick” carbon rod gun evaporation assembly (patent pending).**
- **Rack out drawer sample loading system.**
- **Rotating plate specimen table with external accurate tilt control (option).**
- **Large sample capacity,150mm (6") using drawer with up 200mm (8") for top loading.**
- **Sample holders range of options, including grid holders, stub holders.**
- **Carbon and Carbon/Platinum evaporation.**
- **Full range vacuum measuring system.**
- **Fast pumping cycle.**
- **Protective Polycarbonate Implosion Shield.**
- **Selectable evaporation supplies giving x 4 evaporation settings.**
- **Restricted or full vent control to avoid disturbances of samples.**
- **Microcontroller with LCD displays of status and customer data entry for control of systems.**
- **Modular electronics.**
- **Bench mounted unit.**
- **Sputter coating (option) for range of metal targets.**
- **Film thickness measurement for carbon and metal depositions.**

### Product Description

#### Coating sources

The EMS 975 is fitted with a carbon rod gun and metal filament/boat source which can also be used for cleaning TEM and SEM apertures. An optional sputtering source is available.

#### Work chamber

The borosilicate glass work chamber is 250mm diameter x 300mm and mounted on an aluminium support collar. A tough chamber implosion guard is included as standard. The chamber can accommodate specimens up to 8"/200mm in diameter. A unique rack-out specimen loading system gives the user easy specimen access and the hinged lid assembly makes other areas of the vacuum chamber readily accessible.

Typical chamber set up, showing carbon and metal evaporation sources, specimen stage and optional film thickness monitor (FTM)

#### Menu-driven control

The menu-driven microcontroller allows the user access to a range of options, but readily ‘defaults’ to optimum operating conditions, allowing both fully-automatic and manual override as required.

#### Turbomolecular pumping and venting

The EMS 975 uses a modern 100L/s turbomolecular pump backed up by an external rotary vacuum pump (not included, see 91005) with the complete pumping sequence being under fully-automatic control.

The vacuum pump-down sequence is automatically controlled by the system microprocessor. Vacuum measurement is by a combined pirani/penning gauge and is displayed digitally.

Process gases (nitrogen for venting - if fitted - and argon for the optional EMS 350 sputtering attachment) are automatically controlled and can be programmed for use during coating sequences. The vent valve has an adjustable restrictor and programmable vent time to prevent disturbing specimens due to the inrush of gas at the end of the cycle.

A very useful feature of the EMS 975 is ‘vacuum shut-down’, which allows the process chamber to remain under vacuum when not in use. This helps to maintain a high level of system cleanliness and vacuum performance.



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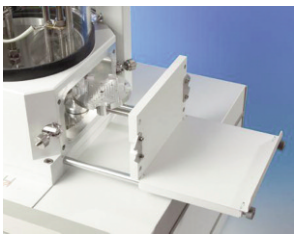
## EMS 975 *(Continued)*

### Specimen stages

The EMS 975 is fitted with an 80mm flat stage as standard, but this may be exchanged for optional holders, such as a 3mm grid holder, low-angle shadowing attachment and a rotary planetary stage (see Options and Accessories). Specimen holders are supplied with a bayonet fixing for quick exchange.

EMS 975 specimen stage and optional film thickness monitor (FTM)

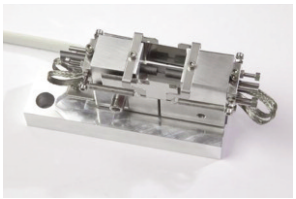


EMS 975 specimen drawer with stage in specimen exchange position

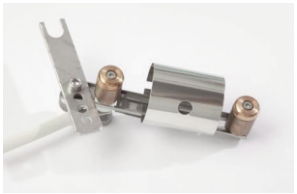
The rotary stage is mounted on a sliding access port on the side of the chamber. This allows the user to exchange specimens quickly without having to remove the glass chamber and disturb any coating set-up. The standard flat stage may be tilted. For rotary shadowing techniques, the standard stage can be tilted from 0° to +/- 180°.

### Chamber base plate and evaporation power supplies

The EMS 975 is fitted with a 0-100A evaporation power supply with base plate terminals for carbon rod evaporation (14V/100A), evaporation from a metal filament (15V/35A), carbon string evaporation (25V/35A) and a terminal rated at 5V/35A for TEM and SEM aperture cleaning using a molybdenum (Mo) boat. A wide range of add-on options is available - see Options and Accessories.



Close up of EMS 975 carbon evaporation source. The 'anti-stick' design ensures smooth movement of carbon rods during evaporation



EMS 975 metal evaporation source fitted. NB: Can also be use to evaporate carbon fiber string

### EMS 975S Thermal Evaporator

The EMS 975S is based on the EMS 975, but a special load lock door allows the loading of wafers up to 8"/200mm. Please contact us for more information.

## SPECIFICATIONS

| | |
|---|---|
| Dimensions and Weight | 450mm (W) x 500mm (D) x 300mm (H). 65kg |
| Work Chamber | Borosilicate Glass 250mm (Dia.) x 300mm (H) with hinged top plate (can accommodate samples to 200mm) (8") in Dia. |
| Implosion Guard | Polycarbonate - readily removable for maintenance |
| Carbon source | Adjustable height with tilt control of 0-200°. Uses 6.15mm Ø carbon rods (source for 3.05mm Ø carbon rods can be fitted - please specify at time of ordering) |
| Metal source | Adjustable height with tilt control 0-200°. Supplied with pack of 10 B5230 tungsten specimen baskets |
| Specimen Stage | With tilt facility 0-45° |
| Vacuum Gauge range | Atm to 1 x $10^{-7}$ mbar |
| Operating Vacuum | Towards 1 x$10^{-5}$ mbar, typically achieved within 15 minutes |
| Low voltage evaporation supply | Pulsed or variable control. Selectable: 0-5V-15V-25V, out-gas current: 0-25A |
| Services | Nitrogen gas (if used for venting). Argon gas (if the optional sputtering attachment is fitted) |
| Vacuum pumping | 100L/s turbomolecular pump. Requires a 50L/m 'backing' rotary pump with oil mist filter |
| Electrical supply | 230V/50Hz (8A max including pump), 115V/60Hz (16A max including pump) |

Supplied with Accessory kit including: carbon rods (6.15mm x 100mm), evaporation filaments, manual rod shaper and operating manual

## ORDERING INFORMATION

| | | |
|---|---|---|
| **91090-C** | EMS 975 Large Chamber Turbo Evaporator complete with carbon source | each |
| **91090-S** | EMS 975S Turbo Evaporator for Semiconductor Wafer Coating | each |
| **91005** | Rotary Vacuum Pump | each |

### Replacement Source

| | | |
|---|---|---|
| **91077** | Carbon Rods (6.15mm Dia.) | each |

### Replacement Parts

| | | |
|---|---|---|
| **91033** | Glass Cylinder | each |
| **91034** | "L" Gaskets | each |

### Optional Accessories

| | | |
|---|---|---|
| **91004-S** | EMS 105 Aperture Cleaning Head | each |
| **92060** | EMS 190 Low Angle Shadowing | each |

6.15mm diameter rods (left)

Carbon rod shaper supplied with the EMS 975 (above)

# EMS 1050 Plasma Asher

**The EMS 1050 consists of a solid state RF Generator and associated tuning circuits, a vacuum system with a solenoid controlled valve, a constant feed gas supply system, and a reaction chamber system which includes two semicircular electrodes and two piece pyrex chamber. The unit has one gas control as standard.**

The solid state RF Generator is a solid state crystal controlled oscillator designed to provide up to 150 watts of continuous wave 13.56 MHz power to the reaction chamber. Maximum power transfer from the power supply to the reaction chamber is accomplished by matching the output impedance of the amplifier to the input impedance of the reaction chamber.

The gas supply system consists of the gas delivery system inside the reaction chamber. This delivery system is a glass tube sealed on the inner end and perforated along its bottom surface. Connections to the delivery tube are fastened with special clips to prevent the possible leakage of contaminants into the chamber.

The EMS 1050 is often used in Asbestos Specimen Preparation as a Low Temperature Ashing Technique.


## FEATURES

- Automatic tuning of RF power.
- Built-in rotary vacuum pump.
- Barrel chamber with isotropic etching.
- Low temperature plasma ashing, etching, and cleaning. (0-150 watts RF)
- Vacuum monitoring.
- Dual flow gauge gas control.
- Accurate process timer.
- Needle valve vent control.
- Micro controller, with default settings programmable by the operator.
- Indication of settings by LCD display of status/entry.
- Indication of conditions during cycle, vacuum, power, time.
- Location bay for backing pump filled with special “oil”.
- Sample carrier for convenient loading.
- Rack-out drawer loading door for ease of sample access.
- Polycarbonate safety shield.

## Product Description

Built to withstand heavy use - 24 hours a day for some plasma ashing schedules - the EMS 1050 features microprocessor control with automatic operation and offers durability and simplicity of operation. Barrel systems plasma etch or plasma ash isotropically (in all directions) and are suitable for the majority of applications.

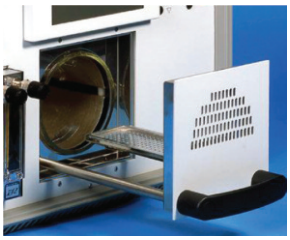
The EMS 1050 uses a low pressure, RF-induced gaseous discharge to modify specimen surfaces or remove specimen material in a gentle, controlled way. A significant advantage over alternative methods is that the plasma etching and ashing processes are dry (no wet chemicals needed) and take place at relatively low temperatures.

A wide range of surface modification methods are available, using a variety of process gases. Using oxygen (or air) as the process gas, the molecules disassociate into chemically-active atoms and molecules and the resulting ‘combustion’ products are conveniently carried away in the gas stream by the vacuum system.

### Chamber, specimen handling and gas control

The EMS 1050 has a 110mm diameter x 160mm borosilicate glass chamber horizontally mounted with a slide-out specimen drawer and viewing window. Evacuation of the chamber is achieved by an optional 50L/m mechanical rotary vacuum pump. Ingress of reactive gases is controlled by two built-in flow-meters backed by solenoid valves.

NB: For applications where borosilicate glass needs to be avoided, the EMS 1050 can be fitted with a quartz chamber.



“Rack Out” Specimen Stage

## Application Example

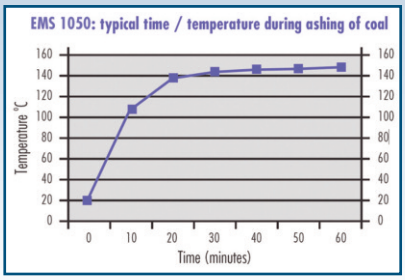
### Low temperature plasma ashing of coal...

The EMS1050 can be used to remove the organic content from coal, leaving a residue of mineral and volatile components for subsequent analysis. The advantage of low temperature RF plasma ashing over other methods, such as heating in a muffle furnace (typically at 700°C), is that many more of the volatile components are retained.

In the following experiment oxygen gas was used with a forward power setting of 100W.

A thermocouple was introduced into the chamber via a vacuum feed through in the rear of the EMS1050 process chamber. The thermocouple was fixed with high temperature resistant tape to the base of a glass Petri dish and covered with approximately 5g of coal granules of approximately 1-2mm$^3$ in size, covering the thermocouple tip to a depth of 1.5mm.

After one hour it was apparent that the temperature had reached a maximum 150°C.



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# EQUIPMENT & ACCESSORIES

## Power, tuning and vacuum monitoring

RF power of up to 100W at 13.56MHz is available and can be infinitely controlled and pre-set to required values. Automatic tuning of forward and reflected power is standard. Forward power and vacuum levels are indicated by the digital display.

## Automated microprocessor control

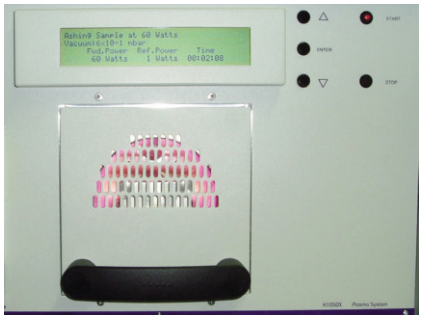
The EMS 1050 is fully automatic. Control parameters for time, power and vacuum are easy to preset and can be monitored and adjusted throughout the process run.

'Autotuning' of RF power for optimum control and reproducibility

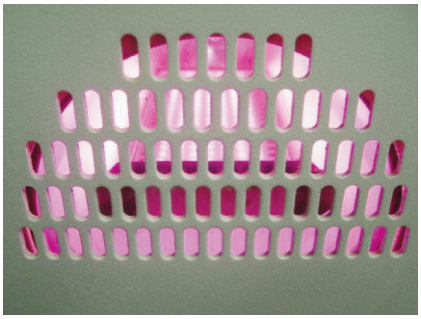
During the plasma process the 'autotune' facility ensures that the RF power is automatically impedance-matched to any variation in the system or loading. This means conditions in the chamber are maintained at their optimum - important as it gives faster reaction times, greater reproducibility of results and protects the power supply during the RF cycle.

## Pumping options

A working system requires only the addition of a specified rotary pump. A fomblinised rotary pump (91005-F) is strongly recommended for safety reasons when applications involve the use of oxygen as a process gas. Where oil-based rotary pumps need to be avoided, we offer dry pumping options (see Specifications).



EMS 1050 during operation



EMS 1050 during operation - close up

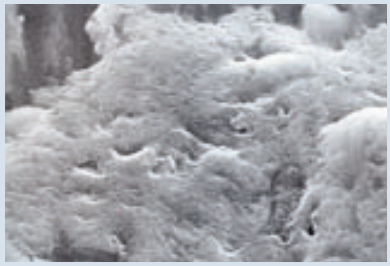
## SPECIFICATIONS

**Instrument Case** .....450mm(W) x 350mm(D) x 300mm(H)
**Barrel Work Chamber** .....'Pyrex' 160mm(L) x 110mm(Dia.)
(Borosilicate Glass as standard)
**Weight** .....25Kg
**Plasma Output**.....Solid State Power Supply: 0-150 watts
continuously variable at 13.56 MHz
with Tuning Control of forward and reflected
power to optimize RF power transfer
**Vacuum Gauge**.....ATM to 1 x $10^{-5}$ mbar Full scale normal
0.5 mbar to 1.0 mbar
**Digital Timer Unit**.....Displays elapsed time with range select:
0-99 min. 99 sec. 0-99 hours.
Automatic termination of Ashing Process
**Dual Gas Flow Gauge** .....Dual Needle Valve flow control selectable
for 1,2 or both gases
**Supply** .....115V 60Hz (6 Amp Max) 230V 50Hz (3 Amp Max)
**Services** .....Process Gas at nominal 5 psi (0.33 bar)

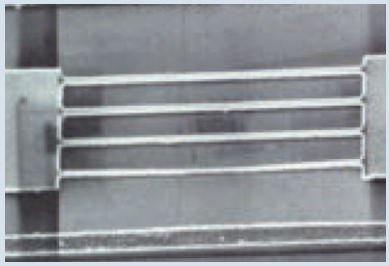
CAUTION: For Oxygen or Corrosive Process Gases Vacuum Pump should use a Synthetic Oil 'Fomblin Oil', or similar.

## ORDERING INFORMATION

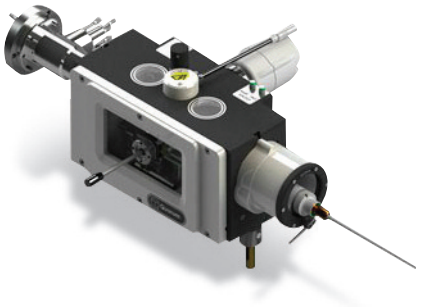
| | | |
|---|---|---|
| **93000** | EMS 1050 Plasma Asher | each |
| **91005-F** | Rotary Vacuum Pump (Fomblin) | each |
| **6563** | Capacitance Manometer | each |
| **6564** | Quartz Chamber and Door | each |



These two SEM micrographs show before and after results comparing identical areas of a metal photo litho plate on which extraneous lines can be visualised. Treatment in a barrel plasma reactor, with oxygen as the process gas, removed the ink - which is essentially a carbon pigment in a binder - without disturbing anything that was present underneath. Subsequent SEM examination shows a scattering of particulate material made up of irregular platelets 0.2 to 2μm in diameter. X-ray microanalysis gave a spectrum characteristic of a clay mineral.



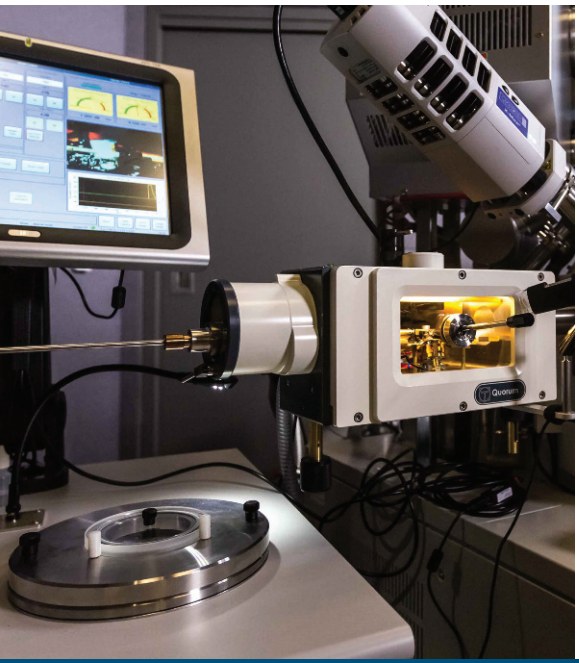
This SEM micrograph shows a set of free-standing single crystal silicon wires for studying thermal transport. The wires were fabricated in silicon-on-insulator material using electron beam lithography and CF4 plasma etching in a barrel reactor. The wires are 40μm long, 1μm wide and 0.5 μm thick and are suspended above a silicon substrate. (Image courtesy of the Microelectronics Research Centre, Cavendish Laboratory, University of Cambridge).



# PP3010T Cryo-SEM/Cryo-FIB/SEM Preparation System

## KEY FEATURES

- High resolution performance on SEM, FE-SEM and FIB/SEMs
- Totally gas cooled, including cryo preparation chamber – no boiling nitrogen on the SEM
- Efficient cooling (down to at least -190°C)
- 24 hours plus run times on one fill of LN2 are typical – allowing unattended overnight operation (at typical operating temperatures)
- Large recipe driven touch-screen interface
- Automated sublimation, coating and system start up
- Superb specimen visibility (including preparation chamber CCD camera)
- Fully compatible with SEM beam deceleration/stage bias modes up to 5kV
- Off column cooling and pumping systems – minimum mass on the SEM
- On-screen data logging and diagnostics
- Pumped storage of the cryo transfer device
- Prepdek™ workstation – self contained work area, extra bench space not required
- Cryo workflow options
- Specialist support and three-year warranty



## PRODUCT DESCRIPTION

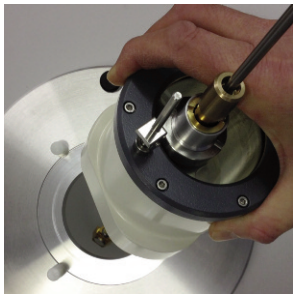
The PP3010T is a highly automated, easy-to-use, column-mounted, gas-cooled cryo preparation system suitable for most makes and models of SEM, FE-SEM and FIB/SEM.

The PP3010T has all the facilities needed to rapidly freeze, process and transfer specimens. The cryo preparation chamber is turbomolecular pumped and includes tools for cold fracturing, controlled automatic sublimation and sputter coating. After processing, the specimen is transferred from the cryo preparation chamber onto a highly stable SEM cold stage for observation. Cold trapping in the cryo preparation chamber and SEM chamber ensures the whole process is frost-free. Specimen process times are typically between five and ten minutes.

## PRODUCT FEATURES

**Mounting, Freezing and Transferring Specimens – Easy with the Prepdek™ Workstation**

The PP3010T Prepdek™ workstation is fitted with a slushy nitrogen freezing station, connected to the pumping system. Rapid freezing reduces ice crystal damage and results in improved specimen preservation. For handling pre-frozen material the Prepdek™ freezing system allows specimens that have been frozen by alternative freezing methods (or stored field specimens) to be manipulated – in or just above liquid nitrogen – and then transferred under vacuum into the PP3010T preparation chamber for subsequent processing and observation.



*Slushy nitrogen freezing station*

Additionally the TEM Prep Slusher and Glove Box Interface/Airlock options allow workflow amongst a range of other platforms, including cryo-TEM, cryoultramicrome, XPS and glove box.

**Cryo Transfer Device – Including Vacuum Storage**

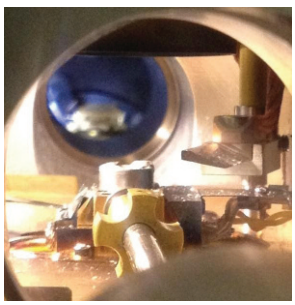
The vacuum transfer device is compact (fits easily into one hand), reliably vacuum-tight and has a bayonet connection to the specimen shuttle to ensure rapid pick up and transfer.

Set into the Prepdek™ work surface is a pumped storage tube for the cryo transfer device (see Prepdek™ workstation section below).

*Specimen transfer device*

**Specimen Stubs, Shuttles**

The PP3010T is supplied with universal 10 mm specimen stubs with surface slots, holes and a flat area – useful for most specimen types. Blank and slotted stubs are also included. In addition a range of optional holders is available, including shuttles for large specimens and top-loading holders for high pressure freezing, TEM Autogridstm (for cryo-FIB/SEM applications) and clamping shuttles for hard specimens.



*View during specimen transfer*

**Cryo Preparation Chamber**

The cryo preparation chamber is connected directly to the microscope and includes a highly efficient nitrogen gas cold stage, extensive cold trapping and facilities to fracture, sublimate and sputter coat specimens. The chamber is fitted with two fully integrated and interlocked gate valves. The outer load-lock valve includes a pumped airlock which accepts the cryo transfer device – the inner SEM valve ensures rapid high-vacuum to high-vacuum specimen exchange.

*Highly Efficient Gas Cooled Stage and Cold Traps*

At the heart of the cryo preparation chamber is a nitrogen gas cooled specimen stage. The stage has a dovetail fitting to accept a cryo shuttle and can be precisely controlled over a temperature range from 100°C to -190°C or lower. Large gas cooled cold traps located above, below and behind the specimen stage ensure clean, high vacuum conditions in the chamber.

## PP3010T Cryo-SEM/Cryo-FIB/SEM Preparation System (continued)

Both the cold stage and cold traps are cooled with the fully integrated CHE3010 off-column cooling system (see below), which at normal operating temperatures give typical hold times of at up to 24 hours between fills (provided the nitrogen gas is dry).

*High Visibility – Plus CCD Camera*
There is superb visibility into the preparation chamber. In addition to the large front window (75 x 150 mm), there are two top viewing ports. The chamber is lit by three LEDS and a CCD camera allows the specimen cold stage area to be viewed on the control screen and the images saved.

An optional stereo microscope can also be fitted to the cryo preparation chamber

*Cold Fracturing*
Twin fracturing tools manipulators (actively cooled) are available and allow a range of specimen types to be cold fractured.

*Front-mounted fracturing and specimen manipulation tool*

The PP3010T is fitted as standard with a front mounted fracturing and manipulation device. The ball-jointed mount offers flexible movement of the blade which can be used both as a surface pick (probe) and a fracturing knife.

An optional micrometer-advanced fracturing tool with rigid blade is available, in addition to the standard front-mounted tool.

Fractured fragments are captured in the large cold trap located below the specimen stage.

**Automatic Sublimation and Sputtering**
Sublimation temperatures and times can be preset and stored for easy retrieval. The process is fully automatic and graphically displayed on the control screen, showing the actual verses the predicted temperature curves.

The high resolution sputter coater is based on the market leading series of bench top coaters. The coating system will give fine grain films essential for FE-SEM applications. A platinium target is fitted as standard – optional metals include gold, gold/palladium, chromium and iridium. An optional fully integrated carbon fiber evaporation head can also be fitted.

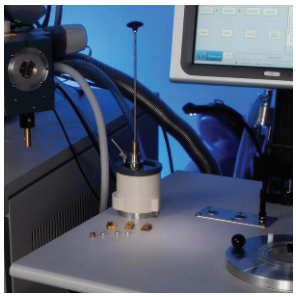
*Remotely mounted turbomolecular pumping system*

An optional terminating film thickness monitor is available.

**Turbomolecular Pumping – High Vacuum Performance**
The preparation chamber is pumped by a remotely-positioned 70 L/s turbomolecular pumping system. Typical preparation chamber vacuums when cold are in the region of $10^{-7}$mbar or better. Positioning the turbomolecular pump away from the SEM ensures total elimination of mechanical vibration and has the advantage of significantly reducing the total cryo system mass connected to the SEM. A vacuum buffer tank (remotely located in the Prepdek™) is automatically pumped when required. The pumping system is connected to the preparation chamber by flexible stainless-steel bellows, which allows flexible positioning of the pumping system.

A 5 $m^3$/hr rotary vacuum pump is required to "back" the turbomolecular pump and for slushing and rough pumping operations. The rotary pump can be located up to five meters from the system, allowing remote location if required. Dry pumping alternatives are available – see Ordering Information.

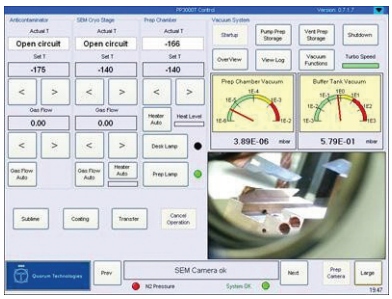
**Prepdek™ Workstation**
The Prepdek™ workstation has been designed to allow specimen mounting, freezing (plus pre-frozen specimen manipulation) and transfer device storage on one ergonomically designed work surface. The control electronics are mounted in a sealed but accessible cabinet beneath the Prepdek™.



*When not in use, the cryo transfer device can be stored under vacuum in the pumped storage tube, located on the Prepdek™ work surface*

Set into the work surface is a pumped storage tube which allows the cryo transfer device to be stored under vacuum conditions when not in use.

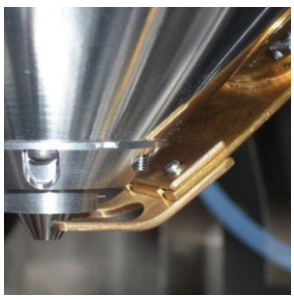
**Panel PC Touch Screen User Interface**
The PP3010T is controlled using a large touch screen panel PC, mounted on the Prepdek™ workstation. User-defined 'recipes' can be entered and stored for instant future access. The screen can be set to suit operator preferences; for example, vacuum measurement can be displayed in millibar, Pascal or Torr.



*Typical screen view during operation (with camera image minimised)*

Many of the key steps in the specimen preparation process are automated (system set up, gas flow control, sublimation and sputter coating).

**SEM Cold Stage, Cold Trap and Cooling System**
A highly stable, thermally isolated, nitrogen gas-cooled stage attaches to the SEM stage. The SEM stage and cold trap are cooled by separate cold gas circuits – both capable of reaching temperatures of -190°C or lower. This configuration allows the operator to select stage and cold trap temperatures that are optimized for specific specimens. For example, for some non-biological materials, it is useful to hold the specimen at very low temperatures – for example, a cold stage temperature of -175°C. This is possible with the PP3010T, as cold trap temperatures of -190°C or lower can be selected, but not possible with conduction cooled systems. The SEM cold stage has a temperature range of down to -190°C and a temperature stability of < 0.5°C.



*Gas-cooled SEM cold trap (temperatures down to -190°C). Tailor-made to suit each SEM*

## PP3010T Cryo-SEM/Cryo-FIB/SEM Preparation System (continued)

**Compatibility with SEM Stage Bias Mode**
The PP3010T cold stage is fully compatible with SEM stage bias/beam deceleration modes of up to 5kV.

**CHE3010 Off-Column Cooling**
The CHE3010 is a fully integrated, remotely mounted cooling system which comes as standard with every PP3010T. The CHE3010 is used to cool the SEM stage, SEM cold trap and cryo preparation chamber cold stage and cold traps and will typically reach temperatures down to -190°C or lower.

The CHE3010 is remotely positioned (typically on the floor behind the microscope) and at normal operating temperatures can run for up to 24 hours between fills. This greatly simplifies the cryo process (no more checking on dewar status and topping off), but also allows overnight, unattended operation – particularly useful for some automated FIB/SEM "slice and view" protocols.

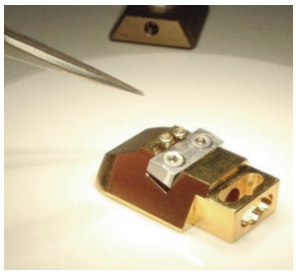
**Single Port Interface to the SEM or FIB/SEM**
Where SEM geometry allows, both the cryo preparation chamber and the SEM cooling system can be fitted to a single chamber port (the minimum port diameter is 38 mm). This gives a tidy installation and frees up a valuable chamber port.

## OPTIONS AND ACCESSORIES

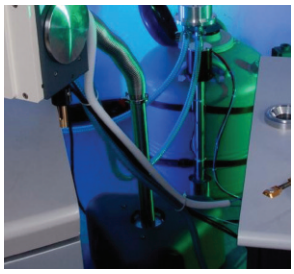
**Specimen shuttles and stubs**
The PP3010T is supplied with a selection of holders, and a range of additional specimen shuttles and stubs is also available. (See Ordering Information for details).

**Carbon Evaporation and Film Thickness Monitor**
A carbon evaporation attachment and a terminating film thickness monitor can be fitted. Both are fully integrated (no external control boxes required).

**Pressurized $LN_2$ Dewar**
The PP7450/60L is a highly recommended option that generates dry nitrogen gas used for cooling the SEM cold stage & cold trap and cryo preparation chamber and cold shields. In addition, $LN_2$ can be decanted for



*Specimen shuttle*



*Gas cooling dewar and turbo pump*

## SPECIFICATIONS

### Cryo Preparation Chamber (column-mounted)

| | Standard? |
|---|---|
| Gas cooled preparation chamber with a twenty-four hour run time between fills | Yes |
| Two integral gate valves (loading and SEM) with appropriate electrical interlocks | Yes |
| Variable temperature gas-cooled specimen stage | Yes |
| Large cold shield above, below, behind the cold stage | Yes |
| Robust micrometer-fed fracturing knife (actively cooled) | Option |
| Side-mounted surface knife/probe (actively cooled). A range of scalpel blades can be fitted to suit different specimen requirements | Yes |
| Automatic sublimation (controlled and viewed on the touch screen) | Yes |
| Fully automatic, high resolution sputter coater with platinum (Pt) target. (Other targets, including gold (Au), gold/palladium (Au/Pd), chromium (Cr) and iridium (Ir), are available as options.) Sputtering controlled and viewed on the user touch screen | Yes |
| Carbon fiber evaporation head and power supply | Option |
| Large front viewing window (150 x 78mm) plus top viewing ports | Yes |
| Preparation chamber camera (CCD) | Yes |
| Vacuum transfer device | Yes |
| Chamber illumination — three LEDs | Yes |

### Pumping System and Controls

| | |
|---|---|
| Remotely-mounted turbomolecular pumping system (70L/s). Includes: vacuum buffer tank, vacuum valves and stainless-steel bellows connection to the preparation chamber. Typical preparation chamber vacuum when cold: $10^{-7}$ mbar | Yes |
| Single 50L/m rotary pump required | Order separately |

### SEM Cooling Dewar, SEM Cold Stage and Cold Trap (anticontaminator)

| | |
|---|---|
| Gas-cooled nitrogen cold stage assembly (-190°C). Temperature stability of >0.5°C | Yes |
| Separate gas-cooling circuits for SEM stage and SEM anti-contaminator | Yes |
| 21L capacity, off-column cooling dewar with run time between fills of up to 24 hours | Yes |
| SEM CCD camera-fitted when space allows | Yes |
| LED lighting (interlocked) | Yes |

### System Control and Specimen Handling

| | Standard? |
|---|---|
| Control via a color user touch screen monitor (15") mounted on the Prepdek™ | Yes |

- Multi-ability user interface screen
- Quick, easy overview of system status
- User-definable "recipes" can be stored
- Quick access to videos outlining preparation techniques and system maintenance
- Fully automatic sputtering
- Automatic sublimation
- Quick, easy overview of system status
- CCD camera image of preparation chamber

| | |
|---|---|
| Twin liquid nitrogen slushing and specimen handling system — ideal for handling pre-frozen specimens. Mounted on the Prepdek™ | Yes |
| System electronics stored in a ventilated, sealed unit under the Prepdek™ | Yes |

### Specimen Shuttles and Stubs (Others available — see Ordering Information)

- (2) AL200077B specimen shuttles (to hold 10mm diameter cryo stubs)
- E7402 blank 10mm stubs — pack of 10
- E7449-5 multi-stubs 7mm high (with holes and slots) — pack of 5
- 11541 multi-stubs 5mm high (with holes and slots) — pack of 5
- 20529 Dovetail holder shuttle
- 328116510 Brass rivets for fracturing liquids — pack of 100
- E7406 Copper (Cu) stub with 3mm x 3mm slot — pack of 5
- E7407 Copper (Cu) stub with 1mm x 3mm slot — pack of 5 — Yes

### Installation and Training

| | |
|---|---|
| Installation and training at the customer site | Contact EMS |

### Support and Other Information

| | |
|---|---|
| Comprehensive start-up kit with key spares | Yes |
| Three-year warranty | Yes |
| SEM column interfaces and SEM stage adaptor (tailored to each microscope) | Yes |

### Some Options and Accessories (see Ordering Information for full list)

| | |
|---|---|
| Terminating film thickness monitor (FTM) | Option |
| Self-pressurizing $LN_2$ dewar and regulator (for storage and venting) | Option |
| Carbon fiber evaporation head | Option |
| Wide range of specimen holders and specimen stubs | Option |

## PP3010T Cryo-SEM/Cryo-FIB/SEM Preparation System (continued)

slushing (freezing). During normal operation the PP7450/60L will generate dry nitrogen gas for up to eight days usage.

If the PP7450/60L is not included, appropriate, locally sourced, nitrogen gas cylinders can be used. It is important to ensure that it has low moisture content – if in doubt, please contact us.

**Cryoflow Work Options**

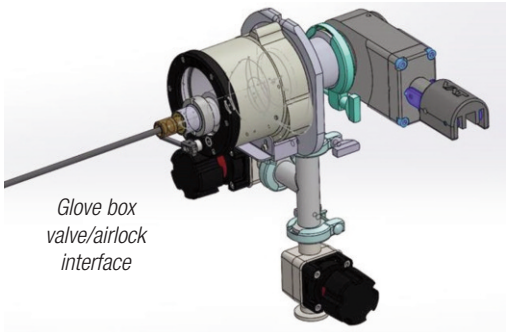
*Glove Box Valve/Airlock InterfaceGlove Box Valve/Airlock Interface*
The airlock is connected to a glove box using a generic NW fitting and for most applications requires a suitable pumping system (rotary pump or turbomolecular plus diaphragm pumping system).

The airlock is designed to accept the PP3010T vacuum transfer device.

For full details of this and other accessories please see Ordering Information.

*TEM Prep Slusher OptionTEM Prep Slusher*
Offers an easy, convenient way of transporting pre-frozen specimens to and from the PP3010T.

- Conveniently locates into the Prepdek™ workstation of the PP3010T
- Freely transportable, e.g. between high pressure freezer, cryoultramicrotome and the PP3010T
- Ideal for loading/unloading TEM grids and grid holders
- Tilting holder for cryo shuttles (holders). Allows the easy transfer of specimens from external freezers (e.g. high pressure, jet, slam etc)
- Option for PP3010T and previous PP3000T and PP2000/PP2000T models



*Glove box valve/airlock interface*


*Cryo preparation chamber with cryo transfer device fitted*

## ORDERING INFORMATION

***For a full quotation, including on-site installation and customer training, please contact us.***

| | | |
|---|---|---|
| **PP3010T** | **Cryo-SEM Preparation System for SEM, FE-SEM and FIB/SEM applications.** | each |

***Includes:*** *column-mounted cryo-preparation chamber with off-column turbo pumping system. SEM cold stage and cold trap, Prepdek™ workstation with dual freezing and specimen manipulation facilities, automatic sputtering and sublimation. Touch screen user interface mounted on the Prepdek™ workstation. Transfer device, (2) specimen shuttles, (10) blank 10 mm stubs, (5) multi-stubs 7 mm high, (5) multi-stubs 5 mm high, Dovetail holder shuttle, (100) Brass rivets for fracturing liquids, (5) Copper (Cu) stub with 3 mm x 3 mm slot, (5) Copper (Cu) stub with 1 mm x 3 mm slot. Microscope interfaces, start-up kit, mounting media and operation manual.*

### Pumping

The PP3010T requires one 50L/m rotary pump (dry pumps available on request).

| | | |
|---|---|---|
| **91005** | 50L/m 115/230V 50/60Hz rotary vacuum pump with oil mist filter | each |

### Options and Accessories

| | | |
|---|---|---|
| **PP7450** | Pressurized dewar (60L) for $LN_2$ storage and venting gas supply | each |
| **10996** | Glove Box Interface/Airlock – for vacuum or inert gas transfer | each |
| **10997** | TEM Prep Slusher option for transporting pre-frozen specimens to and from the PP3010T | each |
| **10998** | Carbon fiber evaporation head including 1m high purity carbon fiber | each |
| **10996** | Film thickness monitor (FTM) | each |
| **12145** | Micrometer controlled fracturing device with tool steel blade. Note: the standard ball-joint mounted fracturing tool is fitted as standard. The 12145 can be fitted in addition. | each |
| **13060** | Two-years spare kit for PP3010T | each |

### Specimen Shuttles

| | | |
|---|---|---|
| **AL200077B** | Standard specimen shuttle with hole for 10mm stub, two included as standard | each |
| **12434** | Specimen shuttle without 10mm hole (flat surface 22mm x 13mm) for large specimens | each |
| **13524** | Shuttle for clamping hard, flat specimens. Suitable for flat specimens (front of shuttle with clamp lever) and cross-fracturing (sprung-loaded vice at rear of shuttle). | each |
| **10245** | Top loading freeze-facture "Balzers" planchette holder shuttle | each |
| **10246** | Top loading specimen holder shuttle (similar to AL200077B but stub clamping mechanism is located on the top – for handling pre-frozen specimens mounted on a stub), one included as standard | each |
| **10247** | Top loading rivet holder shuttle (vice style). Holds two rivets | each |
| **E7433** | Rivet holder stub, screw down style (for use with 10246). | each |
| **12406** | Special shuttle for cryo-FIB/SEM of TEM Autogrid™, accepts two TEM Autogrid™ holders. Includes cryo shield | each |

### Specimen Stubs (10mm diameter)

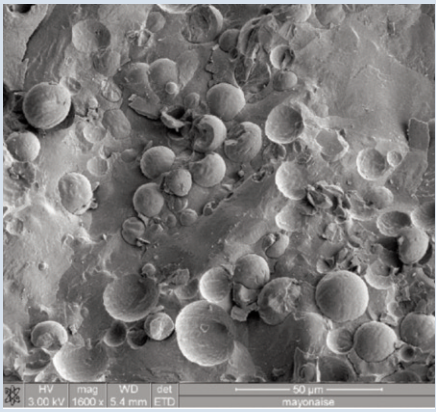
| | | |
|---|---|---|
| **E7449-5** | Universal specimen stub with holes and slots (pack of 5) (10mm dia. X 7mm high), two packs included as standard | each |
| **E7401** | Specimen stub shuttle (spare) | each |
| **E7402** | Aluminium (Al) stubs (pack of 10), one pack included as standard | each |
| **E7403** | Copper (Cu) stubs (pack of 10) | each |
| **E7405** | Screw down stub for thin hard specimens (x1) | each |
| **E7406** | Copper (Cu) stub with one 1mm wide x 3mm deep slot (pack of 5), one packet included as standard | each |
| **E7407** | Copper (Cu) stub with one 3mm wide x 3mm deep slot (pack of 5), one packet included as standard | each |
| **32816510** | Brass rivets for fracturing liquids (pack of 100), one pack included as standard | each |

### Sputter Targets and Carbon Fiber (all targets 24.5mm diameter)

| | | |
|---|---|---|
| **E7400-314A** | Gold (Au) target 0.008" thick | each |
| **E7400-314B** | Gold/palladium (Au/Pd 80:20) target 0.2mm thick | each |
| **E7400-314C** | Platinum (Pt) target 0.2mm thick | each |
| **E7400-314IR** | Iridium (Ir) target 0.008" thick | each |
| **E7400-314Cr** | Chromium (Cr) target 0.3mm thick | each |
| **91047-1** | Carbon fiber cord, high purity — 100cm | each |
| **91047-5** | Carbon fiber cord, high purity — 10m | each |

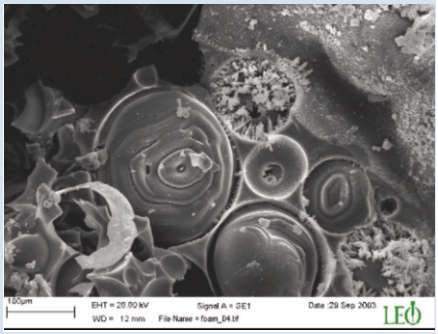
# EQUIPMENT & ACCESSORIES

*Building on the success of the PP3010T cryo-SEM/FIB/SEM preparation system, we are pleased to announce three new related products for ambient and cryo temperature transfer.*



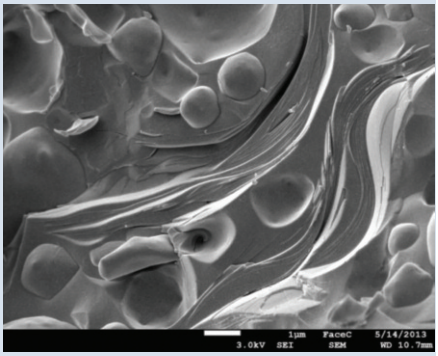
**Mayonnaise**

Image courtesy of FEI Company.



**Shaving Cream**

Fractured at -140ºC, sublimated at -90ºC for 3 minutes and coated with 5nm of platinum.



**Face Cream**

Anti-aging face cream. Specimen rapidly frozen in slushy nitrogen, fractured at -140°C and sputter coated with 5nm of platinum

## Cryo Transfer Systems

### PP3004 QuickLok

*Ambient temperature airlock for SEM, FIB/SEM, beamline and vacuum platforms*

#### Quick Overview

The QuickLok provides a rapid way of transferring ambient temperature specimens into SEM, FIB/SEM or other suitable vacuum systems. A key feature of the QuickLok is the ability to vacuum transfer specimens that are sensitive to normal environmental conditions. The transfer device uses a sealed vacuum chamber which can be interfaced to a glove box for inert gas transfer or allow vacuum transfer from a wide range of platforms.

#### Key Features

- **Rapid specimen exchange**
- **Vacuum and inert gas transfer**
- **Field-retrofittable to most systems**
- **Upgrade path to CoolLok**
- **Custom designed holders available**
- **3 year warranty**

#### Components

Mounted onto a suitable vacuum chamber port, the QuickLok consists of a loading chamber body with integrated controls for pumping, venting and transfer. A custom-designed interface flange and connections to the pumping system are included (see Pumping below).

The compact vacuum transfer device has an easy-release bayonet fitting to a dovetail-profile specimen holder (shuttle). Standard shuttles are included, but optional holders allow a range of specimen types to be handled.

Inside the microscope is a stage to accept the specimen shuttle. To aid specimen exchange an interlocked LED chamber light is mounted to the inside of the QuickLok interface.

#### Use

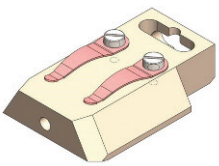
The specimen is mounted on a suitable holder and the transfer device fitted onto the QuickLok. The airlock and transfer device are then evacuated to a pre-set vacuum and the gate valve opened. The specimen is then guided onto the microscope stage.

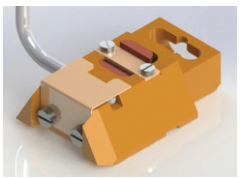
For transfer from other vacuum systems, or a glove box, additional interface flanges are available on request.

#### Pumping

The QuickLok requires either a rotary pump or oil-free vacuum turbomolecular pumping station (see Options).

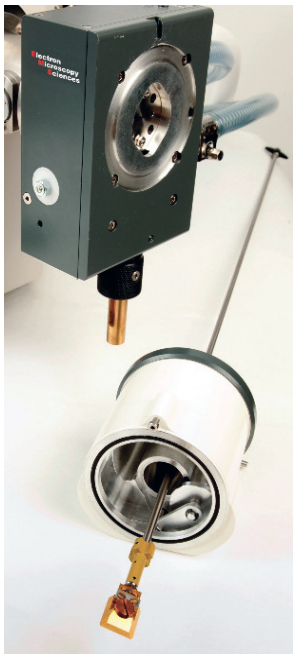
*Specimen Holder Examples*



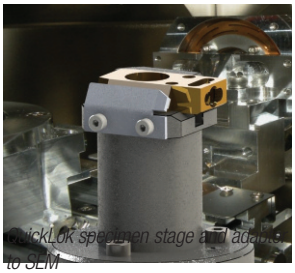


*PP3004 QuickLok*


*Simple controls for specimen exchange*



*QuickLok and specimen transfer device*



*QuickLok specimen stage and adapter to SEM*



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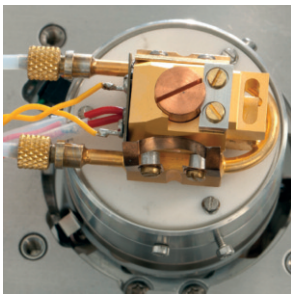
## III Cryo Transfer Systems (continued)

# PP3005 SEMCool

*Non-airlock cryo cooling for SEM, FIB/SEM, beamline and vacuum platforms*



### Quick Overview

The SEMCool is based on the PP3006 CoolLok but without the PP3004 QuickLok components. It is designed for cryogenic applications where airlock exchange of specimens into the microscope is not required.

### Key Features

- **Temperature range down to -190°C, with stability better than 0.5°C**
- **Off-column cooling with all-day runtime between fills**
- **Independent cooling of cold stage and cold trap**
- **Upgrade path to CoolLok**
- **3 year warranty**

### Components

**Specimen holders and transfer device:** The compact vacuum transfer device has an easy-release bayonet fitting to a dovetail-profile specimen holder (shuttle). Standard shuttles are included, but optional holders allow a range of different specimen types to be handled.

*Cold trap - adapted to installation*

**Cold stage and cold trap:** A highly stable, thermally isolated, nitrogen gas-cooled cold stage attaches to the microscope stage. The location and shape of the cold trap is tailored to suit the internal geometry of the microscope. Both cold stage and cold trap are capable of reaching temperatures down to -190°C with a stability of <0.5°C. For easy specimen exchange an LED chamber light is fitted.

The cold stage connects to the microscope stage using an adaptor and has a dovetail fitting to accept a specimen holder. When not in use the cold stage is uncoupled and stored within the chamber with the gas and electrical fittings connected.


*Temperature controller*


*Controller and cooling system*

**Cooling dewar, trolley and controller:** The cold stage and cold trap are cooled by a remotely-positioned, vacuum isolated 21 L dewar and heat exchanger assembly which at normal operating temperatures can run for up to 24 hours between fills. The gas lines between the dewar and the microscope interface are vacuum isolated for maximum thermal efficiency.

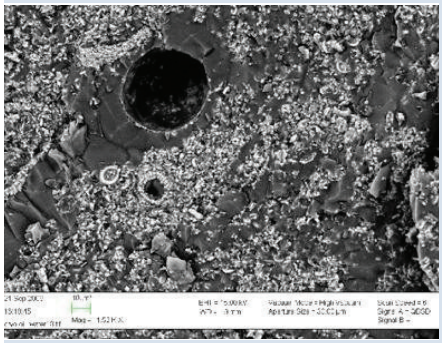
The cooling dewar sits on a floor-mounted trolley which also houses the monitor/controller for cold stage and monitor for cold trap, plus nitrogen gas flow controllers.

### Use

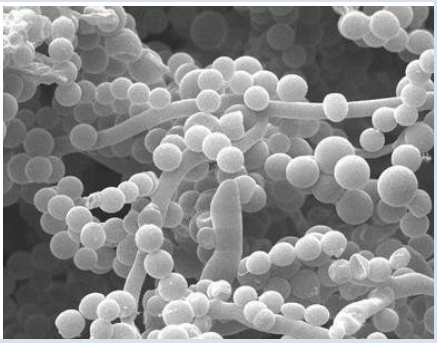
Vent the SEM, locate specimen holder on the cold stage, re-pump the SEM and then cool down to the required temperature. To exchange specimen, warm to above 0°C and vent the SEM.

### Pumping

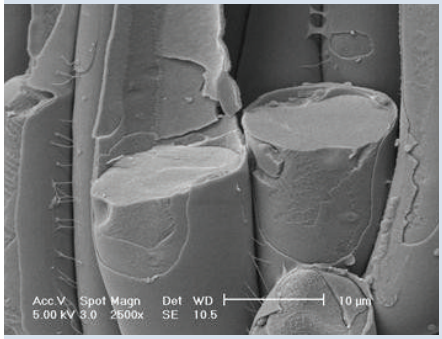
The SEMCool requires a rotary pump to periodically evacuate the vacuum isolated lines (see Ordering Information).



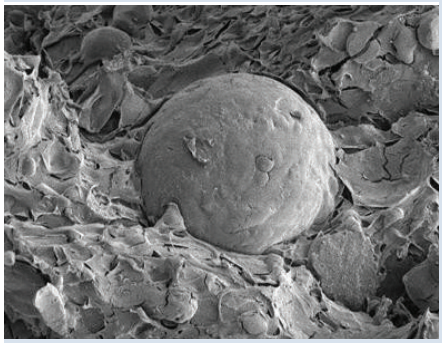
*Cross-section of oil/water/rock.*



*Cryo prepared image of blue stilton cheese (Penicillium roqueforti).*




*Cross-section through plant palisade cells.*

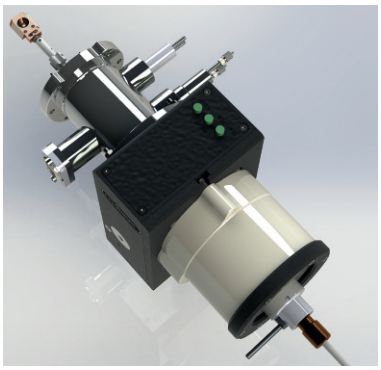


*Cross-section image through sunscreen*

## III Cryo Transfer Systems (continued)

### PP3006 CoolLok

*Cryo transfer systems for SEM, FIB/SEM, beamline and vacuum platforms*



*PP3006 CoolLok*

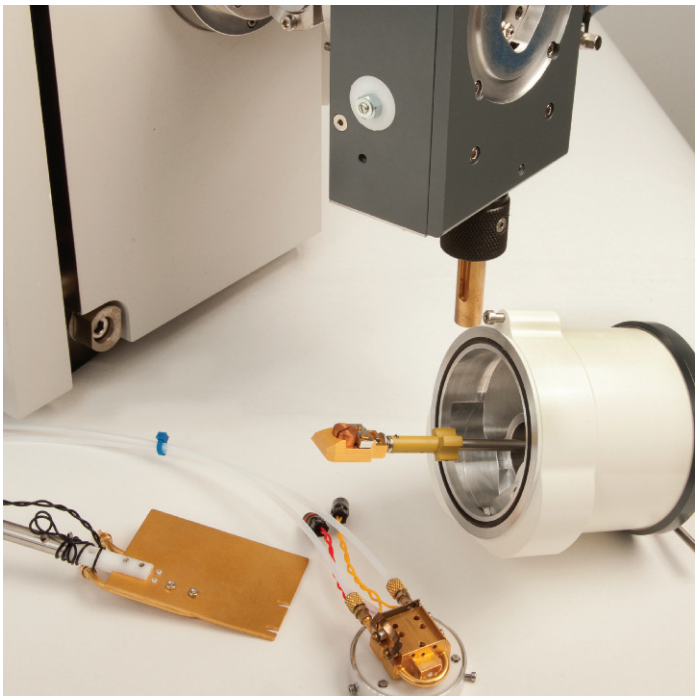
#### Quick Overview

The CoolLok offers rapid transfer and cryo temperature observation of specimens for SEM, FIB/SEM, beamline or other vacuum systems. Applications include thermal protection of beam-sensitive specimens and low temperature observation of materials such as plastics, polymers low-K dielectrics and hard-soft mixtures. The system can also be used for inert gas transfer of ambient temperature specimens from a glove box.

Please Note: The PP3006 is not a replacement for the PP3010T, which is a full cryo preparation system. The PP3006 does not have a cryo preparation chamber and is designed for materials applications where cold fracturing and sputtering are not required.

#### Key Features

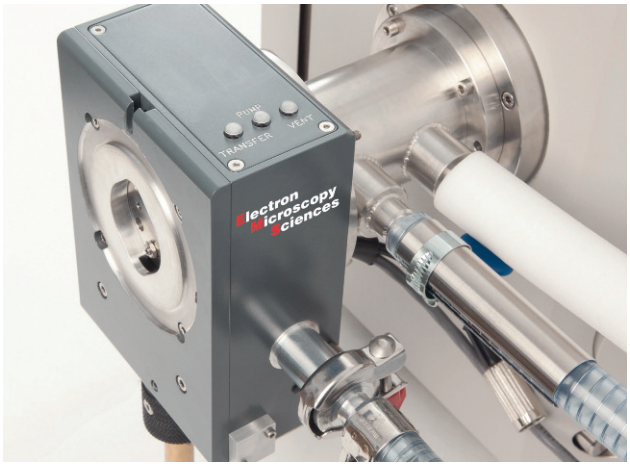
- **Rapid specimen exchange**
- **Temperature range down to -190°C with stability better than 0.5°C**
- **Off-column cooling with all-day runtime between fills**
- **Independent cooling of cold stage and cold trap**
- **Vacuum or inert gas transfer**
- **Rapid specimen freezing option**
- **3 year warranty**



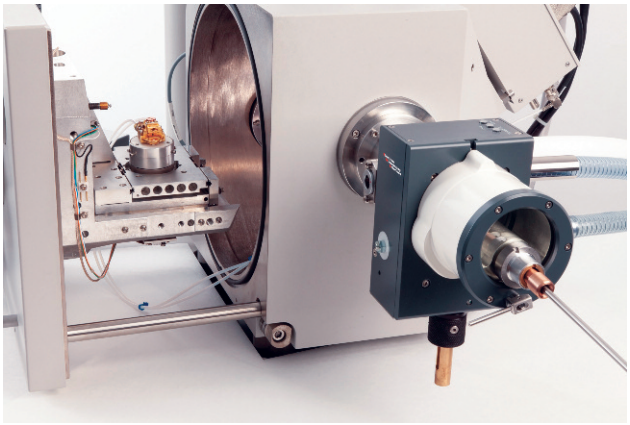
*On-microscope components: airlock, cold stage, cold trap plus cryo transfer device*

#### Components

**Vacuum airlock cold gas feedthrough** Mounted onto a suitable vacuum chamber port, the CoolLok consists of a loading chamber body with built-in controls for pumping, venting and transfer. A custom-designed interface flange to the vacuum chamber and connections and fittings to the pumping system are included (see Pumping below). The interface has cold nitrogen gas feeds to and from the microscope cold stage and cold trap.




*Load lock with vacuum isolated gas cooling lines*

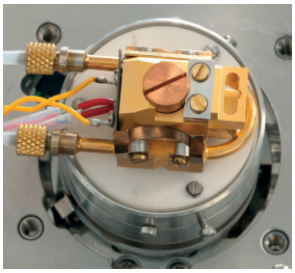


*PP3006 installation example*

**Specimen holders and transfer device** The compact vacuum transfer device has an easy-release bayonet fitting to a dovetail-profile specimen holder (shuttle). Standard shuttles are included, but optional holders allow a range of different specimen types to be handled.

## III Cryo Transfer Systems (continued)

### PP3006 CoolLok (continued)



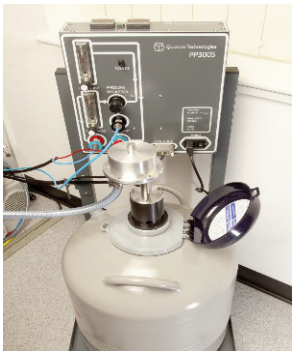
*Cold stage*

*Cold trap - adapted to installation*

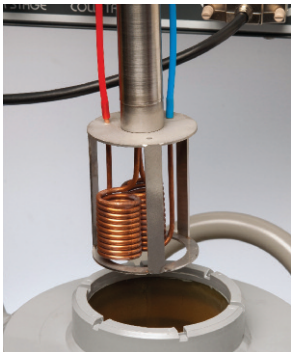
**Cold stage and cold trap** A highly stable, thermally isolated, nitrogen gas-cooled cold stage attaches to the microscope stage. The location and shape of the cold trap is tailored to suit the internal geometry of the microscope. Both cold stage and cold trap are capable of reaching temperatures down to -190°C with a stability of <0.5°C. For easy specimen exchange an LED chamber light is fitted.

The cold stage connects to the microscope stage using an adaptor and has a dovetail fitting to accept a specimen holder. When not in use the cold stage is uncoupled and stored within the chamber with the gas and electrical fittings connected.

**Cooling dewar, trolley and controller** The cold stage and cold trap are cooled by a remotely-positioned, vacuum isolated 21L dewar and heat exchanger assembly which at normal operating temperatures can run for up to 24 hours between fills. The gas lines between the dewar and the microscope interface are vacuum isolated for maximum thermal efficiency.



*Dewar and Controller*

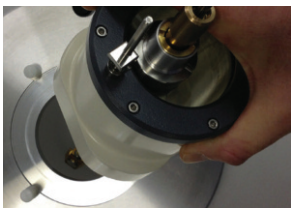


*Heat exchanger*

The cooling dewar sits on a floor-mounted trolley which also houses the monitor/controller for cold stage and monitor for cold trap, plus nitrogen gas flow controllers.

**Rapid freezing station (24429)** With the standard CoolLok, specimen freezing is by contact with the microscope cold stage following transfer and therefore freezing rates are relatively slowly. This is suitable for hard, non-hydrated specimens, but for liquid-based material rapid freezing is essential to reduce the detrimental effects of ice crystal growth and to allow through-vacuum transfer onto the cold stage.

For these applications the optional nitrogen slush freezing station is required. However, for many applications (especially lifesciences) cold fracturing and sputter coating are essential process steps and require the advanced capabilities of the EMS PP3010T – a full cryo preparation system.



*Plunge freezing in slushy nitrogen*

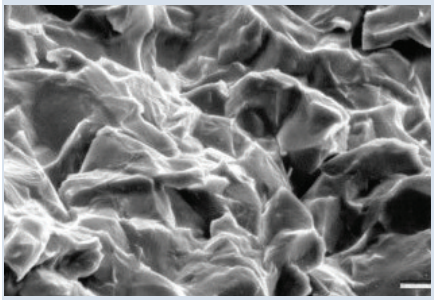
### Use

The specimen is mounted on a suitable holder (shuttle) and the transfer device fitted onto the airlock and the dead space evacuated to a pre-set vacuum level. The gate valve is opened and the specimen guided onto the SEM stage.

For transfer from other vacuum systems, or a glove box, additional interface flanges are available on request. Vacuum transfers can be made from the optional 24429 trolley-mounted nitrogen slush freezing station, if fitted.

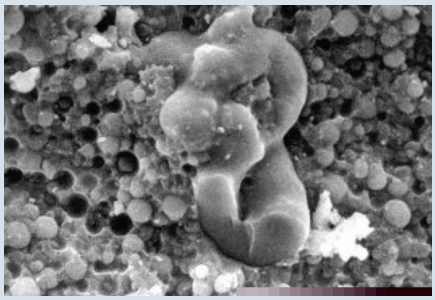
### Pumping

The QuickLok requires either a rotary pump or oil-free turbomolecular pumping station (see Options).



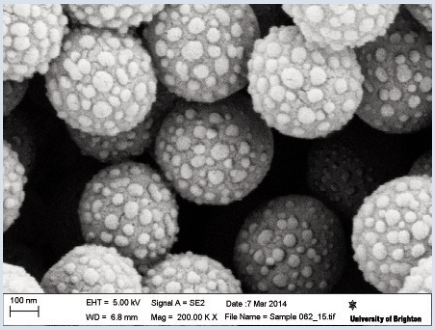
**Wax crystals in gas oil**

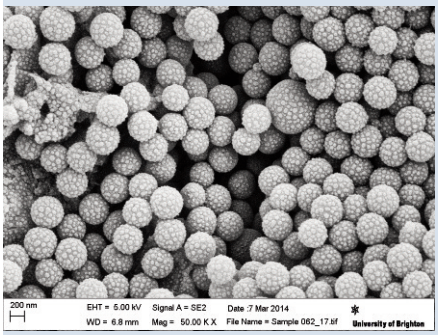
When cooled to a temperature below about 2°C, the waxes in fuel oils such as this tend to crystallize out. Wax crystal size and shape can be varied by altering the rate at which the oil is cooled.



**Stable emulsion of a hydrophobic polymer**

This image illustrates a stable emulsion of a synthetic liquid polymer dispersed in an aqueous continuous phase.




**Latex**

Latex particles are very electron beam sensitive, so cryo-SEM is an ideal method for there observation

Quorum

# EQUIPMENT & ACCESSORIES

## III Cryo Transfer Systems (continued)

### SPECIFICATIONS for PP3004, PP3005, PP3006

| | PP3004 | PP3005 | PP3006 |
|---|---|---|---|
| **Temperature** | Ambient | RT to -190°C | RT to -190°C |
| **Cooling Runtime** | N/A | Up to 24 hours | Up to 24 hours |
| **$LN_2$ Dewar Capacity** | N/A | 21 liters | 21 liters |
| **Cool-Down Time to -190°C** | N/A | Typically <15 minutes | Typically <15 minutes |
| **Rapid Freezing (slushy $LN_2$)** | N/A | Optional (24429) | Optional (24429) |
| **Dewar Trolley Footprint** | N/A | 50 x 50 cm | 50 x 50 cm |
| **Airlock Weight** | 2.5 kg | 2.5 kg | 2.5 kg |
| **Pumping Requirements** | Rotary pump or dry pump | Rotary pump or dry pump | Rotary pump or dry pump |
| **Nitrogen Gas** | For venting and valve operation | Venting and cooling | Venting and cooling |
| **Power Requirements** (excluding pump) | 300 W | 300 W | 300 W |
| **Maximum Specimen Size** | Flat specimens up to 23 x 26 mm. For taller specimens the maximum height will reduce from a mid-point of 9mm. Please contact us for more details. | | |

### ORDERING INFORMATION *For a full quotation, including on-site installation and customer training, please contact us.*

**PP3004** **QuickLok Ambient Temperature Transfer System**
**Includes:**
- Airlock assembly. Pump and vent and transfer controls, valve and fittings to the pumping system (see: Pumping below).
- Custom designed interface flange to the microscope vacuum chamber
- Microscope dovetail stage to accept specimen shuttle. LED chamber light (interlocked)
- Specimen transfer device for vacuum or inert gas transfer
- Specimen holders. Specimen shuttle with holding clips, specimen shuttle blank, specimen shuttle (to hold a 10mm dia. specimen stub), blank 10 mm stubs – packet of 10 each

**PP3005** **SEMCool Non-Airlock Low Temperature System**
**Includes:**
- Nitrogen gas cooled cold stage with heater and sensor and cold trap with temperature sensor. Temperature controllable with a range down to -190°C, 21 L liquid nitrogen dewar with trolley, heat exchanger and LED chamber light. Pump fittings (see: Pumping below).
- Temperature and nitrogen gas flow controller mounted on the dewar trolley.
- Specimen holders. 3 specimen shuttles (to hold 10 mm Ø cryo stubs), blank specimen shuttle, specimen shuttle with holding clips, blank 10 mm Ø stubs (packet of 10), 5 multi-purpose specimen stubs. Note: other holders available
- Specimen mounting compounds (colloidal graphite and Tissue-Tek®) each

**PP3006** **CoolLok Cryo Transfer System**
**Includes:**
- Airlock assembly. Pump and vent and transfer controls, gate valve and fittings to the pumping system (see: Pumping below). Custom designed interface flange to the microscope vacuum chamber.
- Cooling system. Nitrogen gas cooled cold stage with heater and sensor and cold trap with temperature sensor. Temperature controllable with a range down to -190°C, 21 L liquid nitrogen dewar with trolley, heat exchanger and LED chamber light.
- Specimen transfer device
- Specimen holders. 3 specimen shuttles (to hold 10 mm Ø cryo stubs), blank specimen shuttle, specimen shuttle with holding clips,blank 10 mm Ø stubs (packet of 10), 5 multi-purpose specimen stubs. Note: other holders available
- Specimen mounting compounds (colloidal graphite and Tissue-Tek®), interlock cable and pump fittings each

#### Pumping

The PP3004 QuickLok and PP3006 CoolLok require either a rotary pump or high vacuum turbomolecular pumping station (recommended). The PP3005 requires a rotary pump for evacuating the vacuum isolated gas lines.

| | | |
|---|---|---|
| **13034** | Pfeiffer Duo 6 — 5 $m^3$/hr rotary vacuum pump with oil mist filter | each |
| **24426** | Pfeiffer HiCube 80 turbomolecular and diaphragm pumping system | each |

#### Options and Accessories

| | | |
|---|---|---|
| **24429** | Rapid cooling station (for PP3006 only) Consists of a floor-mounted trolley, liquid nitrogen freezing chamber mounted into the work surface which interfaces to the cryo transfer device, connections to vacuum pump (order separately) | each |
| **PP7450** | Pressurized (60 L) $LN_2$ dewar. Boil-off nitrogen gas is used for cooling the stage and cold trap (PP3005 and PP3006 only) | each |
| **13296** | Sircal in-line gas dryer. Helps to reduce water content of nitrogen gas supply | each |

#### Specimen Holders

| | | |
|---|---|---|
| **10245** | Top-loading specimen shuttle for planchettes | each |
| **10246** | Top-loading specimen shuttle, to take a 10mm stub | each |
| **10247** | Top-loading specimen shuttle for rivets (vice style) | each |
| **E7433** | Rivet holder specimen stub, screw-down style (for use with 10246) | each |
| **E7449-5** | Universal specimen stub with surface holes and slots (5 pack) | each |
| **E7401** | Specimen stub shuttle (spare) | each |
| **E7402** | Aluminum (Al) stubs (10 pack) | each |
| **E7403** | Copper (Cu) stubs (10 pack) | each |
| **E7405** | Screw down stub for thin, hard specimens | each |
| **E7406** | Copper (Cu) stubs with 3 x 3mm slots (5 pack) | each |
| **E7407** | Copper (Cu) stubs with 1 x 3mm slot (5 pack) | each |
| **32816510** | Brass rivets for fracturing liquids (100 pack) | each |

#### Sputter Targets and Carbon Fiber

| | | |
|---|---|---|
| **E7400-314A** | Gold (Au) target 0.008" thick | each |
| **E7400-314B** | Gold/palladium (Au/Pd) (80:20) target 0.2mm thick | each |
| **E7400-314C** | Platinum (Pt) target 0.008" thick | each |
| **E7400-314IR** | Iridium (Ir) target 0.008" thick | each |
| **E7400-314CR** | Chromium (Cr) target 0.3mm thick | each |
| **91047-1** | Carbon fiber cord — high purity — 1m | each |
| **91047-5** | Carbon fiber cord — high purity — 5m | each |



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# INDEX

# INDEX





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