

Precision Dimpling Instrument



The Model 515 Precision Dimpling Instrument



The Model 515 Precision Dimpling Instrument is primarily used to pre-thin TEM specimens either prior to ion milling or prior to a quick etch on the Model 550D Single Vertical-Jet ElectroPolisher. The Model 515's precise, automatic operation has proven to be effective on virtually all materials and is invaluable in the preparation of delicate cross-sectional specimens. In addition to TEM pre-thinning, the Model 515 is also used to expose near-surface concentration gradients or to produce tapered sections through surface coatings. Its ability to drastically reduce ion milling times and its varied capabilities makes the SBT Precision Dimpling Instrument an indispensable addition to any materials characterization laboratory.

Special Features

- Digital Termination Micrometer with 1 μ resolution ensures precise dimple depth control and automatic termination without the calculations necessary on less sophisticated barrel micrometers.
- Dimple Depth Gauge provides a dynamic reading which allows the user to continuously monitor dimple depth throughout the thinning process.
- SBT TEM-Prep™ System utilizes a single specimen mount which is transferable between SBT saws, polishing fixtures and disc cutters.
- Upon completion, the arm automatically rises and the user is alerted by an audible alarm thus minimizing supervision.
- Thoughtful design and intuitive operation make the Model 515 ideal for multi-user environments.
- The Model 515 can be transformed into a miniature diamond wheel saw for precise micro-sectioning of small, delicate materials.
- Solid, precise construction and special drive belts eliminate vibration - even at maximum speed.
- Constant tool rotation at slow speeds for dimpling certain materials is possible without the addition of a special motor.
- The Translucent Adjustable Specimen Seat allows both off-center dimpling and back lighting as is often required with cross-sectional specimens.
- Precision bearing assemblies allow sample loads as small as 1 gram which is imperative for extremely delicate specimens.
- An adjustable air dashpot enables the user to control the automatic descent of the tool under varying load conditions.
- A specimen mounting fixture is provided which precludes the need for a special alignment microscope.



Dimpling Technique

A dimple is lapped or polished into a horizontally mounted specimen by simultaneously rotating the specimen and a vertically mounted wheel while using an abrasive slurry at their point of contact. The vertical wheel is mounted on the end of a precisely balanced arm assembly which allows the contact pressure to be adjusted up to 150 grams in 1 gram increments.

Prior to dimpling, specimens are attached to the specimen seat using SBT QuickStick™ 135 mounting wax and the SBT Mounting and Centering Fixture. The sample is easily mounted and centered without the need for a special alignment microscope. After specimen mounting, the specimen seat is placed on the Dimpling Instrument and positioned by adjusting the x-axis micrometer. The y-axis is set at the factory and will not need adjustment even when switching to a different tool diameter. Less thoughtful designs require either a y-axis adjustment or a different height specimen mount to be used when changing wheel diameters.

Once the specimen is properly mounted on the Dimpling Instrument and the desired dimple depth is set using the Digital Termination Micrometer, the dimpling process is initiated by touching the auto-start switch. The auto-start will simultaneously activate both specimen and tool motors while an adjustable air dashpot gently lowers the dimpling tool onto the specimen surface. After reaching an automatic termination point, the motors are shut off, the arm automatically rises leaving the specimen seat accessible for evaluation and an audible alarm sounds alerting the operator.

Timer

The timer, with a digital LED display, provides a method for determining material removal rate during the dimpling process which becomes very useful when processing multiple samples of the same material. The automatic timer can either be used in conjunction with the Digital Termination Micrometer to measure elapsed time or independently allowing dimpling to continue for a preset amount of time.

Accurate Depth and Thickness Control

The SBT Model 515 is equipped with a precise Digital Termination Micrometer (DTM) for easily setting the desired dimple depth and measuring the specimen thickness. The DTM has both metric and English capabilities, a push button zero reset and 1 micron resolution. The DTM offers a number of advantages over less sophisticated mechanical micrometers including greater resolution, accuracy and reliability. For additional thickness control the Model 515 is now supplied with the Model 51505 Dimple Depth Gauge (DDG). While the Digital Termination Micrometer provides both a mechanical stop and electronic termination, the Dimple Depth Gauge provides a dynamic reading of the actual dimple depth. The dynamic reading provided by the Dimple Depth Gauge coupled with the Digital Termination Micrometer provides the dimple depth control required to thin the most fragile materials.

Dimpling Tools

The configuration of a dimple is affected by the size, shape and precision of the tool. The width of the tool will determine the size of the flat region at the bottom of the dimple while the diameter of the tool will determine the slope of the dimple edge. It is not only imperative that the tools are concentric and free from machining marks and other irregularities, it is also critical that a tight fit is maintained between the tool and the arbor shaft. The Model 515 tools and shafts are designed as mating conical pieces which ensures a tight and true fit and eliminates the inherent vertical stability problems encountered with simple non-conical mounts. South Bay Technology tools are manufactured to meet the exacting requirements of our customers and to ensure the consistently high precision that is required.

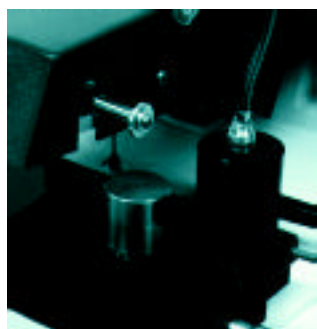
SBT has a wide selection of standard size brass, stainless steel, felt and diamond dimpling tools and has the capability to produce special wheels from any material and in any size. The felt wheels are designed to follow the contour of the dimple and are used as a final polishing step to produce a mirror finish. The felt wheels have a uniform periphery and do not require a tedious cutting and gluing process to mount on the instrument. The diamond tools are designed to drastically reduce dimpling times on very hard materials and are ideal when dry dimpling is required.

ACCESSORIES



Model 51501 Stereo-Zoom Microscope (optional)

The Model 51501 is an optional Bausch & Lomb Stereo-Zoom Microscope (14x - 60x) which is used for routine monitoring of the sample during the dimpling process. The microscope is not required for sample mounting or alignment. The microscope option is typically considered when a standard laboratory microscope is not conveniently available for sample inspection.



Model 51502 Back Lighting Kit (optional)

The Back Lighting Kit is designed to monitor specimen thickness when dimpling translucent materials. With materials like silicon where the color transformation is easily visible at 10 μ , this technique provides an attractive alternative to mechanical specimen thickness measurement. As the light source is not fixed under the specimen seat, the specimen thickness can be monitored either while mounted on the Dimpling Instrument or by removing the specimen seat and viewing the color changes under any laboratory microscope. In either case, the monitoring is accomplished without dismounting the specimen from the specimen seat and without affecting the accuracy of the dimpling operation.



Model 51503 Adjustable Specimen Seat (optional)

The Adjustable Specimen Seat is designed to permit dimple site location at any point on a TEM disc. This capability is ideal for cross-sectional sample preparation when off-center dimpling is often required. The Adjustable Specimen Seat is also a key

element in the SBT TEM-Prep System™ in that the specimen mount can be transferred to and from SBT saws, polishing fixtures and disc cutters without dismounting the specimen.



Model 51504 MicroSaw (optional)

The MicroSaw is designed to utilize the precise motions inherent in the Dimpling Instrument to delicately cut even very fragile samples up to 1/4" in diameter using a 1" diameter diamond cutting wheel. The MicroSaw is ideal for slicing discs from 3mm rods and for slicing cross-sectional sandwiches. The MicroSaw enables you to quickly convert your Dimpling Instrument into a fully functional diamond wheel saw with variable wheel speed, a timer, a micrometer downstop, an automatic arm with an air dashpot for dampening downward motion and an indexing micrometer for accurately aligning serial slices.



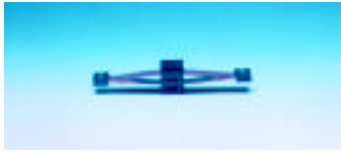
Model 51505 Dimple Depth Gauge (Standard)

The Dimple Depth Gauge (DDG) is used in conjunction with the Digital Termination Micrometer (DTM) to provide accurate dimple depth information. The DTM provides a means for accurately selecting a dimple depth and for automatically terminating the dimpling process. The DTM provides both a mechanical stop and electronic termination. The DDG is initially zeroed and subsequently provides a continuous analog display of the dimple depth in 2 μ m graduations. The dynamic reading provided by the Dimple Depth Gauge coupled with the Digital Termination Micrometer provides the dimple depth control required to thin very fragile materials. The Model 51505 Dimple Depth Gauge is mounted directly onto the Model 515 as a standard feature and can be retrofitted to previously purchased Dimpling Instruments with minor modifications.



Model 51506 Back Lit Adjustable Specimen Seat (optional)

The Translucent Adjustable Specimen Seat is similar in function to the Model 51503 Adjustable Specimen Seat except that the Model 51506 also adds back lighting capability. The Model 51506 utilizes a 1/2" diameter specimen mount with a 2mm diameter pyrex insert in the center. The specimen can be back lit by inserting the standard lamp assembly into the side of the specimen seat. The lamp comes with a 2 foot cord which is plugged into an outlet on the Model 515. This long cord enables the user to examine the sample while mounted on the instrument or by removing it and placing it under any laboratory microscope.



Model 51507 XTEM Clamp (optional)

The Model 51507 is a spring loaded clamp for minimizing glue line thickness in the preparation of TEM cross-section sandwiches. The clamp provides uniform and constant force during the epoxy curing cycle resulting in glue lines less than 1/2µm thick. Because of it's unique design, the clamp cannot be overtightened as with less controllable vise-type configurations.



Model 51598 Accessory Package (optional)

Includes Model 51504, Model 51506, one Diamond Dimpling Tool and one diamond cutting wheel.



Model 51599 Starter Kit for Model 515 (optional)

Includes one 5 gram syringe of diamond paste in sizes 15, 6, 3, 1, and 1/4" micron, 3 ounces of .05 micron alumina suspension, 16 ounces of Syton HT-50, 2 standard specimen seats and QuickStick 135 mounting wax.

Specifications

Specimen Load:	1-150 grams
Specimen Load Resolution:	1 gram
Tool Rotation:	0-250 RPM
Specimen Rotation:	20 RPM
X-Axis Micrometer Resolution:	10 µm
Termination Micrometer Resolution:	1 µm
Dimple Depth Gauge Resolution:	2 µm
Y-Axis Alignment:	Factory Set
Timer Range:	99 minutes 59 seconds
Timer Resolution:	1 second
Microscope Magnification:	14x - 60x
Dimensions:	14" W x 14" H x 21" D
Net Weight:	34 Lbs.
Electrical Input:	95-120 VAC 50/60 Hz 200-240 VAC 50/60 Hz

Model 515 Precision Dimpling Instrument Includes

0541-041 Digital Micrometer

Model 51505

Dimple Depth Gauge

02-03334 Brass Tool Kit--includes:
16 x 3mm tool; 16 x 1.5mm tool;
13 x 1.5mm tool.

01-03322 Standard specimen seat

01-03368 Specimen centering tool

02-03335 Polishing cloth hub assembly

02-03398 Mounting wax; sample kit

02-03410 Polishing Kit - Includes:
13.5 x 1.5mm felt cloth (5 qty);
16.5 x 1.5mm felt cloth (5 qty)

02-03328 Weight Kit - Includes:
1, 2 and 3 gram weights



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