

Model 170

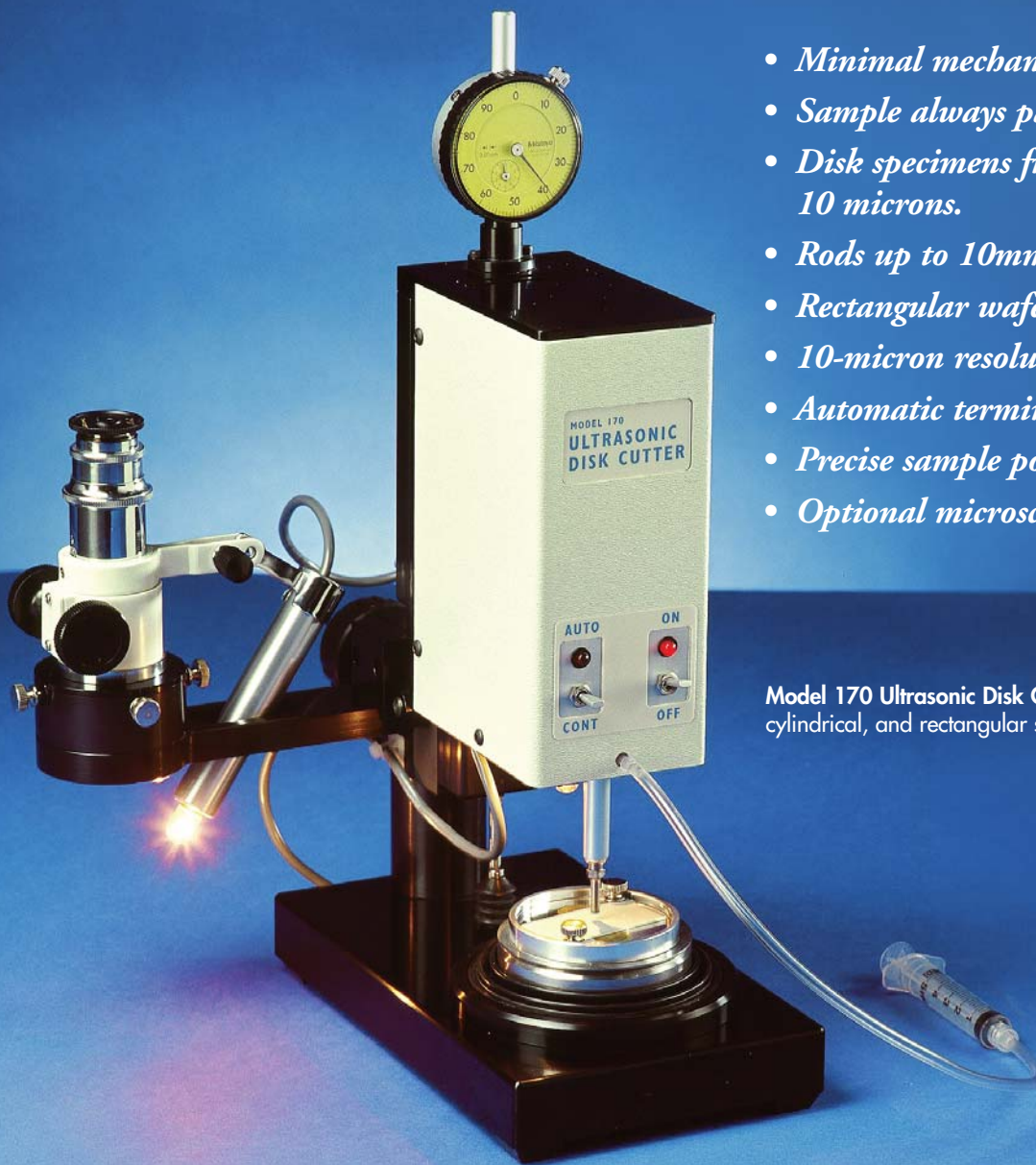
Ultrasonic Disk Cutter

Quickly cut TEM specimens from hard, brittle materials without mechanical or thermal damage



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Model 170 Ultrasonic Disk Cutter



- *Minimal mechanical and thermal damage.*
- *Sample always parallel to the cutting axis.*
- *Disk specimens from materials as thin as 10 microns.*
- *Rods up to 10mm long.*
- *Rectangular wafers for XTEM specimens.*
- *10-micron resolution depth indicator.*
- *Automatic termination.*
- *Precise sample positioning.*
- *Optional microscope attachment.*

Model 170 Ultrasonic Disk Cutter creates disk, cylindrical, and rectangular specimens.

Cut TEM or XTEM specimens

Ultrasonic disk cutting is a proven method for producing specimens for transmission electron microscopy (TEM) from hard, brittle materials such as ceramics, semiconductors, and geological substances. This rapid technique

directly produces disk specimens from materials as thin as 10 microns, cylindrical rods up to 10mm long from bulk samples, or rectangular wafers that are subsequently used in the preparation of cross-section TEM (XTEM) specimens.

Ultrasonic cutting action

The Model 170 Ultrasonic Disk Cutter uses the excitation of lead zirconate titanate (PZT) crystals oscillating at a frequency of 26kHz to effect cutting tool movement. The cutting medium is an abrasive slurry of either boron nitride or silicon carbide.

Tool motion is optimized to cut at the maximum rate while minimizing mechanical-induced and thermal-induced specimen damage.

A dial indicator with a resolution of 10 microns accurately displays the cutting depth of the tool.

Constant-force stage

During the cutting process, the specimen stage applies constant force to advance the material parallel to the cutting tool to produce specimens with a consistent diameter. It also allows rods to be cored from bulk samples in just a few minutes. Rods up to 10mm in length can be readily cored for subsequent cutting into 3mm specimen disks.

A rare earth magnetic coupling rigidly holds the specimen container to the stage to prevent damage that can occur if the specimen is allowed to move laterally in relation to the cutting tool. The resulting specimen is essentially free of both edge and surface damage.

Autotermination

The Model 170 uses an electrical continuity detector for determining when the cutting process is complete.

The sample material is glued onto an aluminum specimen plate using a low-melting-point polymer. Two thumbscrews rigidly attach the specimen plate to the specimen container, maintaining electrical continuity between the container and stage.

The cutting tool and ultrasonic transducer assembly are maintained at ground potential. A +0.8VDC signal is placed on the specimen stage. When contact is made between the tool and the aluminum specimen plate, continuity is sensed and the process is automatically terminated. An override switch gives the user the option of continuing cutting even after continuity is sensed.

When cutting conductive material, a specimen plate with an insulating layer on its surface is used to isolate the specimen from the termination signal.

Optional microscope attachment

A microscope attachment helps locate the specific area of interest in the bulk material, an important aspect of producing a 3mm disk. The microscope is rigidly attached to the ultrasonic cutting head and is easily rotated into place to observe and position the specimen. A simple alignment procedure adjusts the microscope's position in relation to the cutting tool.

(continued)

Optional microscope attachment (continued)

Once the region of the material to be cored is established in the field of view, the ultrasonic cutting head is rotated back into position for cutting.

A precision mechanism establishes the angular positioning of the microscope and ultrasonic cutting head with a repeatability of better than 10 microns.

Model 170 specifications

Cutting tools	Available in standard 3.0mm and 2.3mm diameters and rectangular sizes of 2mm x 3mm and 4mm x 5mm Other sizes are available upon request
Dimensions	5" (127 mm) (without microscope); 9" (229mm) (with microscope) W x 15.1" (384mm) H x 10.5" (267mm) D
Weight	15 lb (6.8kg)
Power requirements	110/220 VAC, 50/60Hz, 250 watts
Warranty	One year

Microscope attachment specifications

Magnification	40X
Position repeatability	Better than 10 microns



Optional microscope attachment used to position the sample.



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Cover image: Optical image of an XTEM specimen consisting of multiple individual sections of a microelectronic material. Produced by ultrasonic disk cutting and mechanical grinding.