

# Fischione Instruments

## Specimen Preparation for Electron Microscopy



**Ion beam preparation, contamination solutions, and TEM tomography holders for electron microscopy**

# Ion Beam Preparation



MODEL 1080 PicoMill® TEM Specimen Preparation System

## MODEL 1080 PicoMill® TEM Specimen Preparation System

Combines an ultra-low energy, inert gas ion source, and a scanning electron column with multiple detectors to yield optimal transmission electron microscopy (TEM) specimens.

- Achieve ultimate specimen quality – free from amorphous and implanted layers
- Complements focused ion beam (FIB) technology
- Milling without introduction of artifacts
- Advanced detector technology for imaging and precise endpoint detection
- In situ imaging with ions and electrons
- Microscope connectivity for risk-free specimen handling
- Adds capability and capacity
- Fast, reliable, and easy to use

## MODEL 1040 NanoMill® TEM Specimen Preparation System

Uses an ultra-low energy, concentrated ion beam to produce the highest quality specimens for TEM.

- Variable energy ion source generates ion energies as low as 50 eV and a beam size as small as 1  $\mu\text{m}$
- Ultra-low-energy, inert-gas ion source
- Removes damaged layers without redeposition
- Ideal for FIB processing
- Enhances the results from conventionally prepared specimens
- Room temperature to cryogenically cooled NanoMilling<sup>SM</sup> process
- Rapid specimen exchange for high-throughput applications
- Computer-controlled, fully programmable, and easy to use
- Contamination-free, dry vacuum system

## MODEL 1051 TEM Mill

A state of the art ion milling and polishing system that consistently produces high-quality TEM specimens with large electron transparent areas.

- Two independently adjustable TrueFocus ion sources
- High energy operation for rapid milling; low energy operation for specimen polishing
- Ion source maintains a small beam diameter (100 eV to 10 keV operating energies)
- Continuously adjustable milling angle range of  $-15$  to  $+10^\circ$
- Liquid nitrogen-cooled specimen stage



MODEL 1040 NanoMill® TEM Specimen Preparation System



MODEL 1051 TEM Mill

### MODEL 1061 SEM Mill

A state of the art ion milling and polishing system. It is compact, precise, and consistently produces high-quality scanning electron microscopy (SEM) samples for a wide variety of applications.

- Two independently adjustable TrueFocus ion sources
- High energy operation for rapid milling; low energy operation for sample polishing
- Ion sources maintain a small beam diameter over a wide range of operating energies (100 eV to 10 keV)
- Continuously adjustable milling angle range of 0 to +10°
- Liquid nitrogen-cooled specimen stage (optional)
- Sample rocking or rotation
- Adjustable 10-inch touch screen with a user-friendly interface



MODEL 1061 SEM Mill

### MODEL 1063 WaferMill™

#### Ion Beam Delaying Solution

Full-wafer specimen preparation. With the WaferMill solution for CD-SEM specimen preparation, you can delayer multiple pre-selected regions on a full wafer. The entire process is automated; there is no need to manually touch a wafer.

- Selected-area milling on full 300 mm wafers
- Top-down delayering
- Expose multiple device layers and structures
- For use in multiple areas of a semiconductor fabrication facility:
  - Research and development
  - Process control
  - Yield enhancement
  - Failure analysis



MODEL 1063 WaferMill™ Ion Beam Delaying Solution



# Contamination Solutions



MODEL 1020 Plasma Cleaner

## MODEL 1020 Plasma Cleaner

Cleans specimens immediately before they are inserted into the electron microscope; removes existing carbonaceous debris from the specimen and prevents contamination from occurring during imaging and analysis.

- Simultaneously cleans specimen and specimen holder
- Cleans highly contaminated specimens in 2 minutes or less
- No change to the specimen's elemental composition or structural characteristics
- Oil-free vacuum system
- Readily accepts side-entry specimen holders for all commercial TEM and scanning transmission electron microscopes (STEM)
- For SEM, as well as other surface science techniques
- Handy for evacuating specimen holder vacuum storage containers



MODEL 1070 NanoClean

## MODEL 1070 NanoClean

Removes existing carbonaceous debris from the specimen and holders; prevents contamination during imaging and analysis. Renders hydrophobic grids hydrophilic for life sciences applications.

- Multifunctional; simultaneously cleans specimens, specimen holders, and stubs
- Inductively coupled, downstream plasma for optimal performance
- Sputter-free; no change to elemental composition or structural characteristics
- Accepts two electron microscopy specimen holders
- Compatible with side-entry holders for all commercial SEM, TEM, and STEM
- Accommodates large objects
- Multiple gas inlets with mixing capabilities

### Model 9020 Vacuum Pumping Station

The Vacuum Pumping Station allows for the simultaneous vacuum storage of up to five plasma-cleaned specimens TEM specimen holders.

- Includes a heavy-duty metal base
- Five Model 9010 Vacuum Storage Containers
- A vacuum pumping manifold
- All of the necessary components for connection to the Model 1020 Plasma Cleaner and the Model 1070 Nanoclean.



Model 9020 Vacuum Pumping Station

### Model 9030 Turbo Pumping Station

A powerful, configurable vacuum pumping station for cryo tomography holder evacuation and TEM specimen holder storage.

- Evacuates the Fischione Instruments' Model 2550 Cryo Transfer Tomography Holder during zeolite regeneration
- Pump down Thermo Fisher Scientific (TFS) and JEOL TEM specimen holders and store the holders under clean, vacuum conditions
- Configurable; stack single TFS or JEOL holder ports or use a quad holder dock to mix up to four TFS and/or JEOL ports
- Four configurations available
- Reaches an ultimate pressure of  $<10^{-6}$  Torr
- Oil-free vacuum



Model 9030 Turbo Pumping Station

# Conventional Specimen Preparation



*MODEL 110 Automatic  
Twin-Jet Electropolisher*



*MODEL 130  
Specimen Punch*

## **MODEL 110 Automatic Twin-Jet Electropolisher**

Used for the electrolytic thinning of TEM specimens. The twin-jet technique simultaneously polishes both sides of the specimen, creating electron transparency within a few minutes.

## **MODEL 130 Specimen Punch**

Produces high-quality disk specimens from thin metal foils. A precision ground punch and die plate eliminate specimen stress and distortion.



*MODEL 160  
Specimen Grinder*



*MODEL 170  
Ultrasonic Disk Cutter*

## **MODEL 160 Specimen Grinder**

Mechanically prethins specimens for TEM. Greatly reduces the time spent during the final preparation process of ion beam milling.

## **MODEL 170 Ultrasonic Disk Cutter**

Creates disk, cylindrical, and rectangular specimens; disk specimens from materials as thin as 10  $\mu\text{m}$ , rods up to 10 mm long, and rectangular wafers for TEM cross-section (XTEM) specimens.



*MODEL 180  
XTEM Prep Kit*



*MODEL 200  
Dimpling Grinder*

## **MODEL 180 XTEM Prep Kit**

Includes all the components required to produce high-quality cross-section specimens for TEM. Stacks and holds cross-section specimens, aligns areas and interface of interest, and produces consistent glue layer thickness.

## **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.



# Holders

## MODEL 2020 Advanced Tomography Holder

A revolutionary holder that allows room temperature data collection over wide tilt and translation ranges, even in restrictive pole-piece gap geometries.

## MODEL 2021 Analytical Tomography Holder

Optimizes the acquisition of elemental composition and structural information in three dimensions. Beryllium tip and clamps reduce the addition of spurious or system radiation.

## MODEL 2030 Ultra-Narrow Gap Tomography Holder

Capable of tilting up to 90° while providing a maximized field of view for TEM.

## MODEL 2040 Dual-Axis Tomography Holder

Features an optimal tilt angle range in narrow gap (~5 mm) pole-piece geometries while maintaining microscope resolution.

## MODEL 2045 Motorized Dual-Axis Tomography Holder

A holder that features an optimal tilt angle range in narrow gap (~5 mm) pole-piece geometries, while maintaining microscope resolution. Motorized rotational control for high throughput applications.

## MODEL 2050 On-Axis Rotation Tomography Holder

Accepts either rod- or cone-shaped specimens and rotates them fully through 360° about the axis of the holder.

## MODEL 2550 Cryo Transfer Tomography Holder

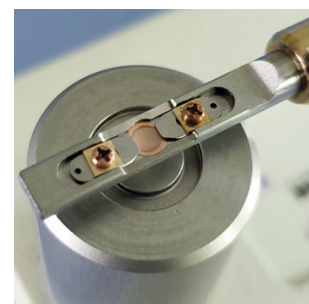
This single-tilt, liquid nitrogen-cooled, cryo transfer TEM specimen holder achieves a base temperature of better than -170 °C. Designed for cryo transfer and tomography of thin-film frozen-hydrated/vitrified specimens for low-dose imaging and analysis.

## MODEL 2560 Vacuum Transfer Tomography Holder

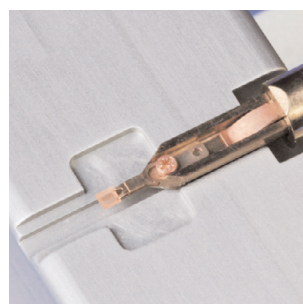
The holder is ideal for sensitive specimens that can be altered by environmental conditions; the specimen can be transferred at vacuum or in an inert gas environment.



MODEL 2020  
Advanced Tomography Holder



MODEL 2021  
Analytical Tomography Holder



MODEL 2030 Ultra-Narrow  
Gap Tomography Holder



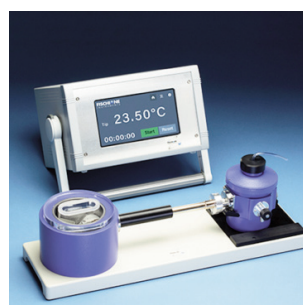
MODEL 2040  
Dual-Axis Tomography Holder



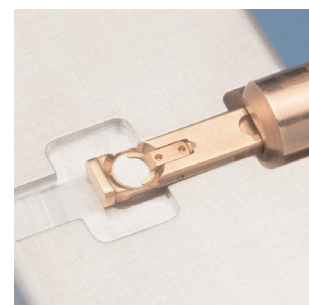
MODEL 2045 Motorized Dual-  
Axis Tomography Holder



MODEL 2050 On-Axis  
Rotation Tomography Holder



Model 2550 Cryo Transfer  
Tomography Holder



Model 2560 Vacuum Transfer  
Tomography Holder

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