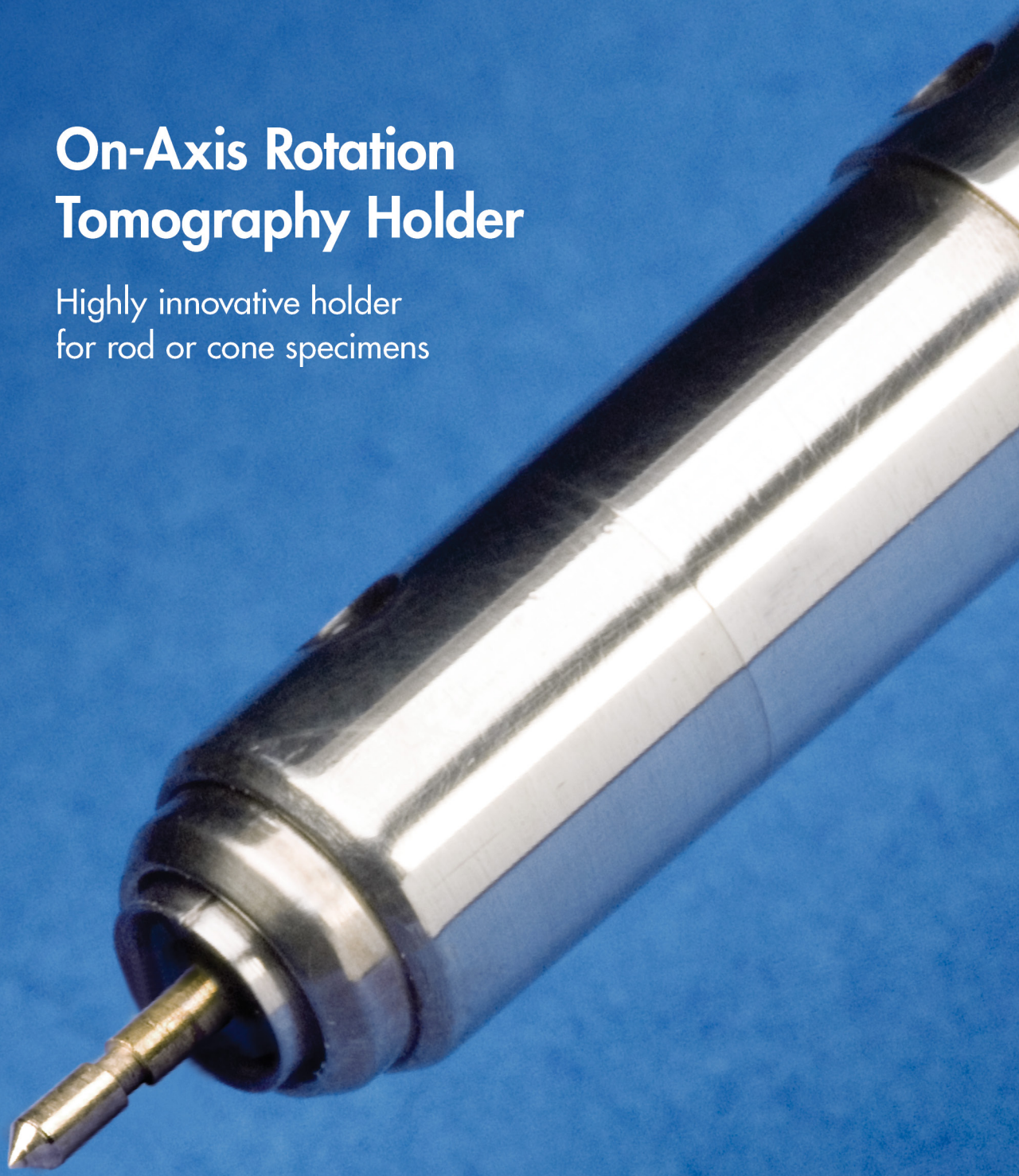
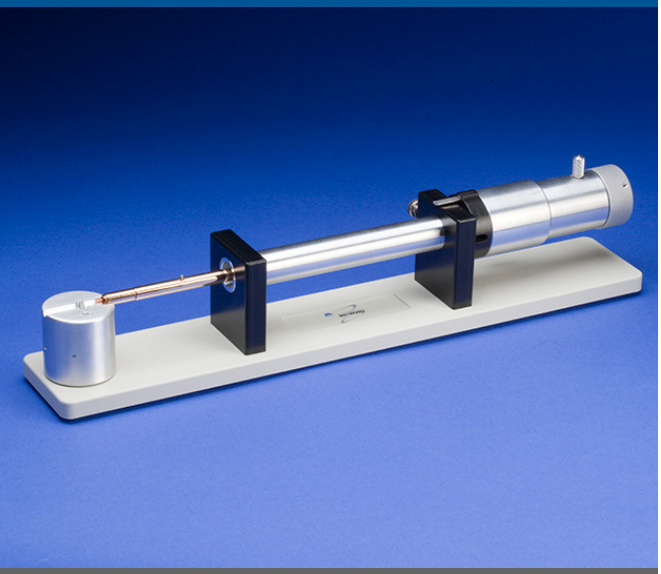
MODEL 2050

On-Axis Rotation Tomography Holder

Highly innovative holder
for rod or cone specimens



FISCHIONE INSTRUMENTS



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.

- **Ideal for specimens prepared by focused ion beam (FIB)**
- **Ideal for atom probe tomography (APT) and field ion microscopy (FIM) specimens**
- **Allows 360° image acquisition and tomographic reconstruction without the loss of information due to the missing wedge**
- **Three-position index allows precise axial rotation of the specimen**
- **Compatible with all pole-piece gap geometries**

PLASMA CLEANING

Fischione recommends that you clean the specimen and specimen holder with the Fischione Model 1020 Plasma Cleaner or Model 1070 NanoClean before insertion into the TEM.

During collection of tomographic data, the electron beam will be on the same area of the specimen for an extended time. As a result, organic contamination may build up on the specimen. A plasma cleaning time of 10 seconds to 2 minutes removes the contamination. Longer cleaning times can remove contamination spots caused by previous TEM viewing of non-plasma cleaned specimens.

When not in use, the holders should be stored under vacuum in Fischione Model 9010 Vacuum Storage Containers or the Model 9020 Vacuum Pumping Station.

Highly innovative holder for rod or cone specimens

The highly innovative 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.

The preparation of rod or conical specimens is an extension of conventional TEM methodology which has historically been associated with a 3 mm diameter disk specimen. With the advent of electron tomography, combined with advances in specimen preparation technology, it became necessary to develop a specimen geometry and holder to optimize three-dimensional tomographic information from the specimen.

On-axis rotation yields the maximum amount of data from the specimen

On-axis rotation – no information loss

Traditionally, single axis tomography results in a missing wedge of information and dual-axis tomography results in a missing pyramid of information. On-axis rotation tomography yields results without the loss of any information, thus providing the maximum achievable amount of data from the specimen.

Operation

The On-Axis Rotation Tomography Holder features a cylindrical specimen cartridge into which a specimen post is inserted. Specimen posts are available in a diameter of either 1.8 mm to accept common atom probe field ion microscope (APFIM) specimen mounts or 1 mm to accept focused ion beam- (FIB) prepared specimens.

In the case of FIB, lift-out techniques are used to transport and attach a thick specimen to the tip of the specimen post. Then the specimen is further FIB-milled into a rod or cone shape and to electron transparency. The specimen post is clamped into the specimen cartridge. The specimen cartridge precisely fits within the body of the holder and is accurately aligned with the eucentric plane of the microscope. The cartridge is rigidly affixed to a mechanism that both moves along and rotates about the axis of the holder.

A dedicated loading station facilitates the positioning of the cartridge into the holder. Once the specimen cartridge has been loaded into the holder, longitudinal movement is manually activated to retract the loaded cartridge into the body of the holder. This protects the specimen during holder insertion in to and removal from the TEM goniometer. Once the On-Axis Rotation Tomography Holder is removed from its loading station, the cartridge is mechanically interlocked into the holder so that it cannot become separated while the holder is in the microscope.

Initially, the specimen can be fully rotated through 360° to select the proper specimen orientation. A stop is then engaged, which fixes the continuous rotation of the specimen with respect to the holder. A three-position precision

FIB FOR TEM SPECIMEN PREPARATION

The focused ion beam (FIB) instrument has become an extremely useful tool for TEM specimen preparation. It allows precise positioning of the area of interest within the bulk material. In addition, its sophisticated software control allows the specimen to be extracted from the bulk in the shape of a rod or cone with a substantial area being electron transparent. The Fischione Model 1040 NanoMill® TEM specimen preparation system can readily provide additional specimen thinning to remove amorphization or Ga implantation.

indexing mechanism provides the means to orient the specimen in 120° increments. At each increment, while keeping the specimen position fixed with respect to the holder, the microscope's goniometer is tilted to ± 60° to acquire a tomographic tilt series. Indexing the rotation of the specimen by 120° two more times, combined with the ± 60° goniometer tilt, yields data corresponding to 360° of specimen rotation. This procedure maximizes the amount of tomographic data obtained from a single specimen.

Following TEM imaging and analysis, the specimen cartridge can be removed from the holder and securely stored in a storage box which can also be used to safely transport the specimens.

Touch protection

Fischione's Advanced Tomography Holders are compatible with the TEM's touch-alarm that stops goniometer movement in the event that a pole touch occurs. Always be aware of the TEM's pole piece configuration and follow the microscope manufacturer's recommendation for operating the goniometer at high-tilt angles.

ATOM PROBE FIELD ION MICROSCOPY

The atom probe field ion microscope (APFIM) combines the principles of both time-of-flight mass spectroscopy and point projection microscopy. The APFIM is able to identify individual elements and to locate them within the bulk material at the atomic level.

The atom probe specimen is a small pointed tip with a radius of approximately 100 nm or less. In essence, whereas a typical TEM specimen is thin in one dimension, a typical APFIM specimen is thin in two dimensions.

Once the specimen is inserted into the APFIM, a positive voltage applied to the tip creates a very high electric field that strips electrons from surface atoms and accelerates the resultant ions toward the imaging detector.

Lighter ions reach the detector more quickly than their heavier counterparts. To accurately measure the time of ion departure, the positive voltage is typically pulsed. The arrival time of the ion is recorded on the single particle detector. The time-of-flight of the ion yields elemental identity.

This process of field evaporation provides a three-dimensional image of the evaporated specimen. For optimal atom probe tomography, it is advantageous to correlate results with TEM images of the area of interest within the specimen, which means a suitable specimen holder such as Fischione's is important.

Ordering information

All Fischione Advanced Tomography Holders come with a dedicated loading station for secure specimen handling, tools to assist in specimen clamping, and a Fischione Model 9010 Vacuum Storage Container for storing the holder in a clean, vacuum environment.

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