



CryoMAT™

The CryoMAT™ is an optimized QuickLoader™ module for investigation of non-wet materials that enables thermal protection for sensitive samples; combining rapid sample transfer, cryogenic cooling and temperature control for a SEM or DualBeam™

The CryoMAT is a materials-dedicated cryogenic upgrade to QuickLoader (loadlock system for SEM and DualBeam) and meets the demand for easier and more practical operation than a generic full cryo transfer system. The investigation of many non-traditional, non-wet materials (hard/soft mixes, composites or beam and vacuum sensitive materials) in the microscope chamber requires new solutions for easy handling and transfer. The CryoMAT upgrade is designed to assist investigation of this material class by providing a mechanism for non-hydrated sample transfer, cryogenic cooling and temperature control within the SEM or DualBeam.

The CryoMAT + QuickLoader combination is simpler than a traditional cryo transfer system and can help stabilize non-wet materials (typically materials with < 2% water). The system does not require pre-freezing equipment or external vacuum system, and only requires a single transfer step (using the QuickLoader). Temperature is microprocessor controlled and the stability is better than +/- 1 °C. The environmentally friendly cooling design reduces liquid nitrogen consumption and in most cases requires only one filling per day.

The FEI CryoMAT enhances application possibilities of the SEM or Small Dual Beam by providing cryogenic sample conditions in the system. Samples can be loaded and unloaded at room temperature (using the QuickLoader) but observed or FIB milled while held at a constant low temperature. The result is a simple system to use for demanding tasks such as delicate integrated circuit TEM sample preparation, investigation of soft material structure and stabilization of hard-soft material samples. The CryoMAT also enables characterization of these material classes in 3D using DualBeam automated processes like Auto Slice & View™ serial sectioning in a DualBeam. The CryoMAT + QuickLoader combination can enable investigation of many challenging materials.

Key benefits

- Thermal protection for beam sensitive samples
- Provides more rigidity for soft material investigation
- Temperature flexibility, operating range +50 °C to -190 °C
- Temperature stability of better than +/- 1 °C
- Enables Cryo FIBbing with Auto Slice & View™
- Enables Cryo TEM prep of beam sensitive samples
- Environmentally friendly designed Heat exchanger dewar operates for one day from a single liquid nitrogen filling
- Retrofit is possible for many of FEI's SEM/DualBeam™ microscopes

Application examples

- Static imaging (2D)
- Auto Slice & View DualBeam investigation with volume reconstruction (3D)
- TEM and Atom probe sample preparation

Examples of used sample types

- Low K dielectrics
- Polymers
- Plastic manufactured products
- Composite materials
- Hard and soft material mixes
- Dehydrated samples (CPD or Freeze Dried)

Essential specifications

Compatible with the following systems

System control is hardware interlocked and software integrated. See the QuickLoader datasheet for details.

- Inspect™ S and F*
- Inspect S50 and F50
- Quanta™ 250, 450 and 650
- Quanta 200, 400 and 600 (MK2 only)*
- Quanta FEG 250, 450 and 650
- Quanta FEG 200, 400 and 600*
- Magellan™ 400*
- Nova™ NanoLab 200, 600 and 600(i)*
- Helios NanoLab™ 600*
- Quanta 3D 200 and 200i
- Quanta 3D FEG

CryoMAT specifications

- Temperature operating range +50 °C to -190 °C
- Temperature stability - < 1 °C
- Time to reach cryogenic temperature – 15 minutes @ -130 °C (sample dependant)
- Duration for liquid nitrogen dewar – guaranteed 8 hours (set temperature dependant)

QuickLoader vacuum system

- Vacuum is integrated with the SEM or DualBeam, requiring no additional vacuum pump
- Integrated and interlocked with the system to ensure safe and simple operation
- Evacuation time: ~20 seconds

Documentation

- Operation instruction in the microscope control software “help” menu
- User manual

Warranty and training

- 1 year warranty
- Simple design makes formal training unnecessary
- User manual with instructions included

Installation requirements

- Installation port must be equipped with QuickLoader (excluded)
- Environment: same as standard microscope with QuickLoader installed
- For software control, the system needs to be using a compatible software version

Sample sizes for CryoMAT

- Maximum diameter ≤ 10 mm
- Maximum thickness ≤ 5 mm

Sample size directly influences the cooling rate and final temperature

Consumables

- Cryo sample stubs (10 stubs included) - 10 mm diameter x 10 mm long stubs can be obtained from microscope consumable suppliers
- 2 shuttles/sledges and 1 test sample (included)

* Instruments may require a software upgrade for QuickLoader software integration

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