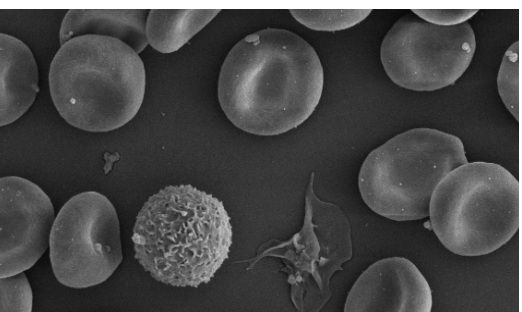
From Eye to Insight

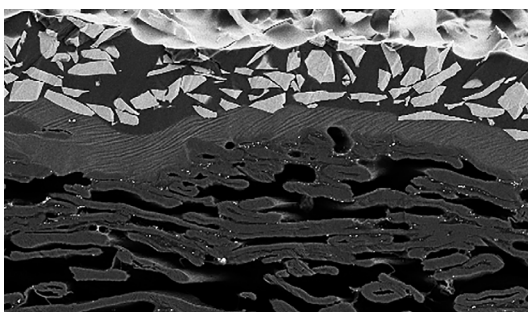
Leica
MICROSYSTEMS

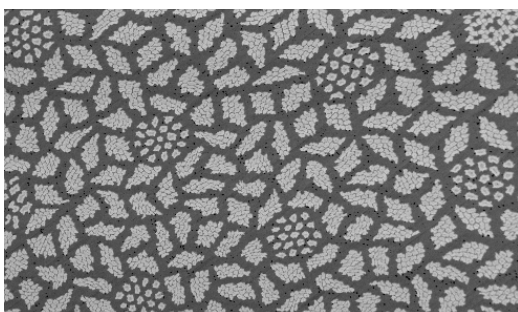
# MEETING THE CHALLENGES OF EM SAMPLE PREPARATION

## THE LEICA NANOTECHNOLOGY PRODUCT PORTFOLIO

The highly comprehensive product portfolio for preparation of biological, medical, and industrial samples.







# SAMPLE PREPARATION WITH LEICA MICROSYSTEMS – THE PORTFOLIO THAT GIVES YOU SUCCESS FOR YOUR APPLICATION

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|---|---|
| TRIMMING & MECHANICAL PREPARATION | EM TXP, EM RAPID, EM TRIM2 |
| ION BEAM MILLING | EM TIC 3X, EM RES102 |
| ULTRAMICROTOMY & CRYO-ULTRAMICROTOMY | EM UC7, ARTOS 3D, EM FC7, EM KMR3 |
| SAMPLE TRANSFER | EM VCT500, EM VCM |
| CRYO CLEM | EM Cryo CLEM |
| CRYO PREPARATION | EM ICE, EM GP2, EM AFS2, EM CTD |
| COATING & FREEZE FRACTURING | EM ACE200, EM ACE600, EM ACE900 |
| TISSUE PROCESSING | EM TP |
| CONTRASTING | EM AC20 |
| CRITICAL POINT DRYING | EM CPD300 |

CONCENTRATING ON WORKFLOW SOLUTIONS, WE PROVIDE A PRODUCT RANGE THAT IS ALIGNED TO YOUR NEEDS IN TEM, SEM, LM, AND AFM INVESTIGATIONS.

Cover images: top: Nematode Eubostrichus dianae with ectosymbiotic bacteria layer, critical point dried with the EM CPD300 (source: Mag. N. Leisch, University of Vienna, Austria); bottom left: Human Erythrocytes and Lymphocytes, critical point dried with the EM CPD300 (source: Dr. W. Müller, University of Utrecht, Netherlands); bottom middle: cross section of abrasive paper, prepared with the EM TIC 3X (source: Wolfgang Grünewald, TU Chemnitz, Germany); bottom right: cross-section of a Nb3Sn superconductor, prepared with the EM TXP and EM TIC 3X (source: Wolfang Grünewald, TU Chemnitz, Germany).

# THE COMPLETE PORTFOLIO FOR EM SAMPLE

## TRIMMING & MECHANICAL PREPARATION

**EM TXP**
Target preparation device for milling, sawing, drilling, grinding and polishing samples prior to examination by SEM, TEM and LM techniques. A perfect system to pre-prepare the sample prior to the ion beam milling techniques.

- > Accurate location and preparation of microtargets
- > In-situ stereomicroscope observation
- > Automatic process control to produce a mirror-like surface quality

**EM RAPID**
Advanced specimen trimming device for TEM, SEM, LM.

- > 0.5, 1, 10, 100 µm step advance
- > Adjustable cutting speed 300–20,000 rpm
- > Advance indication on LCD display

**EM TRIM2**
Specimen trimming device for TEM, SEM, LM.

- > 1 µm step advance
- > Perpendicular viewing of the sample
- > LED illumination
- > Cutting speed 20,000 rpm

## ION BEAM MILLING

**EM TIC 3X**
The Triple Ion Beam Milling System allows production of cross sections and planed surfaces for SEM microstructure analysis (EDS, WDS, Auger, EBSD) and AFM investigations.

- > Broad and deep cross sections as well as uniform large area milling
- > Interchangeable stages – Standard stage, Multiple sample stage, Cooling stage, Rotary stage
- > EM VCT500 option for environmentally sensitive and / or cryogenic sample transfer

The EM TIC3X outfitted with an EM VCT500 docking station is the ideal solution for environmentally sensitive sample and / or cryogenic sample transfer.

**EM RES102**
Unique ion beam milling device with two modified saddlefield ion sources of variable ion energy for optimum results. It combines the preparation of TEM, SEM, and LM samples in a single benchtop unit.

- > External control of the milling process via LAN
- > Preparation of samples up to 25 mm diameter
- > Fully computer-controlled milling parameters

## ULTRA MICROTOMY & CRYO-ULTRA MICROTOMY

**EM UC7**
Ultramicrotome for ultrathin sectioning of biological and industrial samples.

> Knife usage monitoring
> Feed range from 1 nm up to 15 µm
> Fully motorized knife stage and AutoTrim function
> Vibration decoupled gravity stroke

**EM FC7**
Low temperature ultrathin cryosectioning of biological and industrial samples. Can be mounted on the EM UC7 and the ARTOS 3D.

> Temperature range from +110 °C to -185 °C
> Individual temperature settings of specimen, knife, and gas
> Easy section collection using micromanipulator and EM CRION ionizer
> EM VCT500 option for environmentally protected sample transfer

The EM FC7 outfitted with an EM VCT500 transfer port is the ideal solution for environmentally sensitive sample and / or cryogenic sample transfer.

**ARTOS 3D**
Array Tomography Solution for automatic creation and collection of hundreds of serial-section ribbons ready for array tomography with a SEM.

> Fast setup with programs pre-defined by the user for different section carriers
> Wrinkle-free sorting and positioning of ribbons on the section carrier ready for SEM imaging
> Uses the same small section carrier through the entire workflow from sectioning to imaging
> Also and Ideal solution for CLEM as transparent section carriers are available

**EM KMR3**
Balanced-break glass knife maker for producing 45° glass knives from 6.4 mm, 8 mm, and 10 mm glass.

> Highly reproducible, outstanding knife quality
> Automatic reset of the breaking and scoring mechanism
> Ergonomic design for comfortable use

## SAMPLE TRANSFER

**EM VCT500**
Versatile vacuum cryo transfer system for contamination-free transfer of specimens between different preparation and analysis instruments.

> Workflow specimen monitoring
> Links workflow from preparation to analysis
> Connects to more than one SEM
> Various specimen holders for SEM, FIB-SEM, freeze-fracture and more

**EM VCM**
$LN_2$ cooled workstation for contamination-free specimen manipulation.

> All sample transfers from loading under vacuum
> Improved connectivity given by a movable loading sphere, adaptors to the Cryo CLEM and Cryo-TEM transfer holders

## CRYO CLEM

**EM Cryo CLEM**
The system ensures contamination-free sample transfer and loading from cryo sample preparation instruments to Leica fix stage light microscope. Maintains sample vitrified during cryo imaging.

> Rapid screening of large areas and fast determination of regions of interest in the electron microscope under controlled cryo conditions
> The cryo objective with low working distance (0.28 mm) and with NA 0.9 for high resolution (364 nm) ensures fast and specific localization of target structures in EM

# CRYO PREPARATION

**EM ICE**
High pressure system for freezing aqueous samples delivers optimal sample preservation. Offers the highest flexibility to meet multiple application demands.

- Programmable sequential freezing of nine (3 × 3) samples
- Automated $LN_2$ re-filling of the sample storage dewar
- Recovery time between freezing cycles is one minute
- Retrofitable light stimulation and/or electrical stimulation mode

**EM ICE Light Stimulation (LS)**
All the features of EM ICE standard, in addition offers fully integrated light stimulation.

- Software integrated programming for LS
- Automatic recondition of the specific light module
- Modules with different LEDs (wave lengths): UV, blue, red, green, amber
- Detailed log file of each experiment
- Light stimulation precision of 1 millisecond

**EM ICE Electrical Stimulation (ES)**
All the features of EM ICE standard, in addition offers fully integrated electrical stimulation.

- Millisecond precision
- Complete coordination of electrical discharge at the moment of freezing
- Capturing and imaging action potential and membrane trafficking events

**EM GP2**
Automatic plunge freezer for EM grids.

- Automatic single sided and multiple sided
- Single sided sensor blotting
- Fast, easy, and safe filling of the secondary cryogen with the unique liquifying head
- Controllable secondary cryogen temperature
- Environmental chamber with adjustable temperature and humidity
- Intuitive control via touch panel

**EM AFS2**
Freeze substitution and low temperature embedding for light and electron microscopy.

- –140 °C to +70 °C working range
- Transfer function – $LN_2$ gas regulation in the chamber to minimize contamination
- LED UV polymerization
- Stereomicroscope viewing
- AFS smart-remote observation of the process and delivery of critical information via SMS

**EM FSP**
Automatic reagent handling / dispensing system for freeze substitution and PLT.

- One step preparation
- Safer, convenient handling
- Flexible built-in UV light for polymerization
- Up to 20 samples per run

**EM CTD**
Cryo tool dryer

- Combines heated air flow and heating plate for reliable de-icing
- Maximum temperature +50 °C

## COATING & FREEZE FRACTURING

**EM ACE200**
Desk-top coater for homogeneous coatings of conductive metal or carbon for EM. Fully automated instrument, options include:

- > Carbon thread evaporation
- > Sputtering
- > Both methods with interchangeable heads
- > Quartz crystal measurement
- > Planetary rotation
- > Glow discharge

**EM ACE600**
Fully automated, versatile high vacuum coater produceing very thin, fine-grained, conductive metal and carbon coatings. Up to two angled coating sources configurable. For high resolution analysis, required for FE-SEM and TEM applications.

- > Sputtering
- > Carbon thread evaporation
- > Carbon rod evaporation
- > E-beam evaporation
- > Glow discharge
- > 104 mm automated rotating stage with planetary option
- > EM VCT500 option for cryo-coating, freeze-fracture, double-replica, and controlled environmental transfer with the VCT shuttle

The EM ACE600 outfitted with an EM VCT500 is the ideal solution for contamination-free cryo-SEM sample preparation with complete environmental control.

**EM ACE900**
High-end system for freeze fracture applications. High vacuum, a 3-axis movable microtome, and low angle e-beam coating with rotation ensure the best results for TEM replicas and together with the EM VCT500, contamination-free cryo-SEM block face imaging.

- > Large closed cryo-shield
- > Rotating cryo stage
- > High resolution low angle e-beam coating of carbon / metal
- > Gate valves for e-beam sources and load lock (sample and knife exchange)
- > EM VCT500 option

## TISSUE PROCESSING

**EM TP**
Automated routine tissue processor.

- > Pre-heating and pre-cooling of the reagents
- > Versatile: EM, EM high throughput, and LM
- > The sample carousel holds 24 EM or 12 LM vials

## CONTRASTING

**EM AC20**
Automatic contrasting of ultrathin sections for electron microscopy.

- > 60 runs per one set of Ultrostains
- > Low reagent consumption
- > High contrast

## CRITICAL POINT DRYING

**EM CPD300**
Critical point dryer for biological (pollen, tissue, plants and insects) and industrial (Micro Electro Mechanical Systems (MEMS), hydro or aerogels) samples.

- > Reduced process times by Leica filler / sample holder concept
- > Minimized $CO_2$ consumption and minimal user interaction time
- > Integrated waste separator avoids direct contact with chemical waste

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