

# CMS196V<sup>4</sup>

NEW


Cryo-Correlative Microscopy System for Vitrified Sample Characterisation



- CLEM workflows
- Review of Cryo Samples
- Cryo-Fluorescence
- FIB-SEM Lamella Workflows
- Cryo-Spectroscopy, Cryo SR
- Fits most upright uScopes

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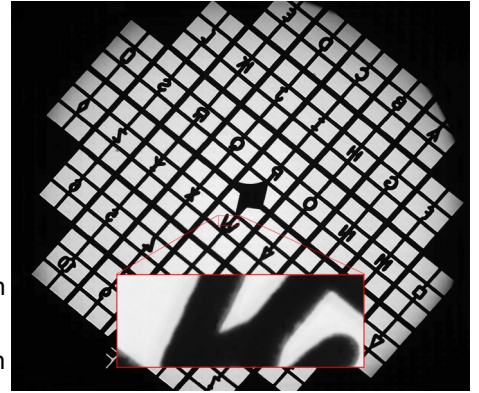
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# Introducing the CMS196V<sup>4</sup>

The CMS196V<sup>4</sup> is a cryo-correlative microscopy system enabling cryo-fluorescence, the full workflow of Correlative Light and Electron Microscopy (CLEM) and Cryo-super resolution.

While electron microscopy (EM) provides structural information at very high resolution, it can give only restricted insight into biological and chemical processes due to limitations in staining and sample preparation processes. Fluorescence microscopy on the other hand is a very sensitive method to detect biological, chemical and genetic processes and events inside living cells. Cryo-CLEM brings together the dual advantages of low temperature fluorescence and cryo-EM by imaging the same sample location with both techniques, while also superimposing the complementing information

The CMS196V<sup>4</sup> maintains the vitrified state of the sample by liquid nitrogen cooling and provides proven capabilities to safely handle and transfer your cryo-samples. These can then be imaged with optical microscopy whilst ensuring they remain free of contamination. The integrated, encoded and motorised XY stage enables the co-ordinate mapping required to find the same sample feature again on complementing modalities, for example TEM, FIB-SEM or X-ray systems.



Automated high-resolution tiling of EM grid with integrated encoded XY system.

## Features

### SELF-CONTAINED AUTOMATED LN<sub>2</sub> TOP-UP

The gentle liquid nitrogen top-up ensures samples remain vitrified whilst also protecting the sample from contamination with a supply of clean nitrogen vapour and a liquid cold-trap.

### INTEGRATED ENCODED MOTORISED XY STAGE

The encoded, motorised stage provides a highly stable platform allowing high precision automated mapping of the complete EM grid with 1 µm resolution.

### CRYO-SAMPLE INTERFACE AND COMPATIBILITY

Sample cryo-cassettes ensure safe sample loading, transfer and storage. One cassette can hold up to 3 EM-grids. Dedicated Cassettes (see table on back cover) support standard EM grids, Clipped Grids, Planchettes, Bessy, Si<sub>3</sub>N<sub>4</sub> frames, CryoCapCell and JEOL CRYOARM™.

### INTERCHANGEABLE CRYO-BRIDGE

The CMS196V<sup>4</sup> has an interchangeable cryo-bridge which enables the user to configure the stage for custom requirements.

### CORDLESS HEATED MAGNETIC SAMPLE CHAMBER LID

The heated frost-free lid allows convenient viewing of the sample area. This is powered by self-aligning magnetic contacts without the need to plug in the lid.

### INTEGRATED LED CONDENSER

The integrated LED condenser allows brightfield transmitted light, which is ideal for initial viewing of the grid and locating the sample.

### JOYSTICK TOUCH SCREEN PANEL

The CMS196V<sup>4</sup> can be configured and operated from the connected touch panel. The joystick wheels allow intuitive sample navigation and swift sample review without a PC. The stage can also be controlled via USB and is supported by multiple software packages.

### AUTOFILL LN<sub>2</sub> DEWAR WITH SMART FEATURES

Optional liquid nitrogen 3 litre capacity Dewar extends the unattended run time of the system for to up to 6 hours. In addition, gentle trickle-fill modes allow increased stability for longer acquisition runs.

### MICROSCOPE COMPATIBILITY AND MOUNTS

The CMS196V<sup>4</sup> is compatible with a wide range of research grade upright microscopes and high NA objectives. A quick-release mount further simplifies sample loading for some microscopes.

### OPTIONAL REDUCED SAMPLE DRIFT, LENS' HEATER

Superior drift performance delivered by the continuous filling of LN<sub>2</sub> to the sample chamber, temperature-controlled stage body and an objective lens heater (diameter range 27-30 mm).



CMS196V<sup>4</sup> Sample Chamber and Optical Bridge.



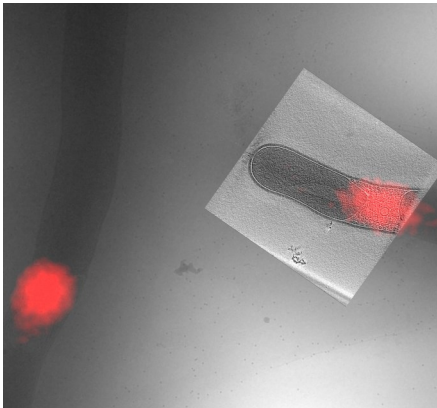
Joystick Touch Screen Panel



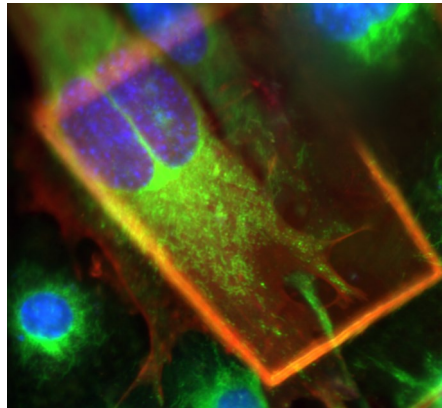
Lens' Heater (optional).

# Application Examples

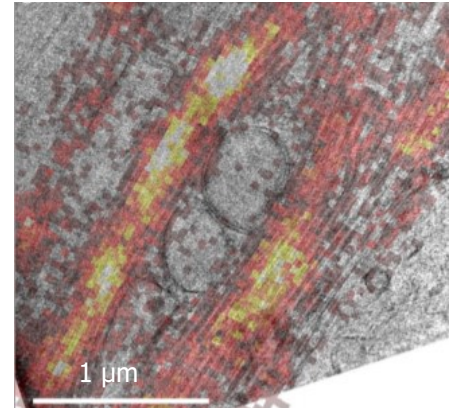
The CMS196 series provides the perfect solution for the correlation of high resolution structural information with biochemical processes within cells. It is used in eminent laboratories worldwide and features regularly in articles in leading scientific journals.



Correlative cryo-fluorescent light microscopy and cryo-electron tomography of WGA stained *Streptomyces* bacteria targeting cross-membrane lipid structures [Ref 1].



Cryo-widefield fluorescence of mouse embryonic fibroblast cells on Quantifoil gold finder grids [Linkam CLEM workshop at the Crick Institute, London 2015].



Overlay of super-res cryoCLEM and diffraction-limited cryoFLM images of U2OS cells, transfected with rsEGFP2-MAP2, over an 18.6 nm thick slice through the sample [Ref 2].

## Testimonial

**Dr Roman Koning, Netherlands Centre for Electron Nanoscopy (NeCEN), and Leiden University Medical Centre (LUMC)**

*"The Linkam cryo-stage was crucial for investigating the ultrastructure of *Streptomyces* bacteria. The CMS196 was indispensable to efficiently localise with fluorescent microscopy the cross-membranes for structural investigation of their intricate structures with cryo-electron tomography. Without it this study would not have been possible".*

## References

[1] Celler K., Koning R.I., Koster A.J., van Wezel G.P. *et al.*

"Cross-membranes orchestrate compartmentalization and morphogenesis in *Streptomyces*." (2016) *Nat Commun.* 13,7. DOI: 10.1038/ncomms11836

[2] Yagüe P, Koning R.I., Koster A.J. *et al.*

"Sub-compartmentalization by cross-membranes during early growth of *Streptomyces* hyphae" (2016)

## Technical Specification

### Temperature Range

Hold at liquid nitrogen temperature

### EM Grids Supported

Standard EM grids, clipped grids (Autogrids™), Planchettes, Bessy, CryoCapCell, Polara, Si<sub>3</sub>N<sub>4</sub> targets and options for custom design

### Motorised XY Resolution

1 µm encoded

### Integrated LED Condenser

For transmitted light brightfield, LED or external source

### Integrated LN Dewar Hold Time

28 minutes

### Optional LN Autofill (3L) Hold Time

Up to 6 hours

### Microscope Compatibility

Compatible with a wide range of research grade upright microscopes

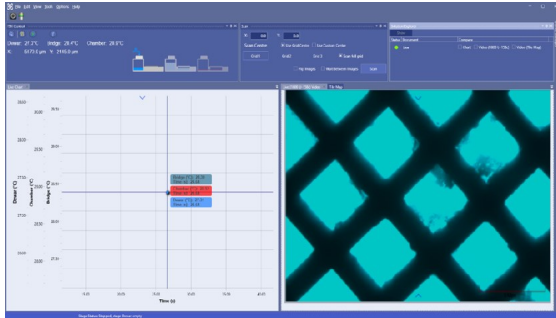


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# Discover More...



## Software

Linkam's NEXUS software for the CMS196V<sup>4</sup> provides complete control and monitoring of the system.

When combined with our optional high sensitivity camera and imaging module, NEXUS enables fully automated and tiled image capture. The system produces a single, tiled image of the full sample area at high resolution with embedded coordinates. This can then be used to navigate the sample as well as to save co-ordinates of areas of interest. Linkam also provides a simple and easy-to-use co-ordinate translation tool for correlating Light and EM images. A full SDK is available for users to integrate control of the CMS196V<sup>4</sup> into their own applications.



## Cassettes and Sample Transfer

The CMS196V<sup>4</sup> is a flexible platform with a range of cassettes available for the most popular sample types. Linkam can also develop custom cassettes to meet your needs. Sample Cassette Transporter (on left) and EM Grid Cassette (on right) shown opposite.

Please see table below for popular cassette types.



## Modular Imaging Platform (MIP)

The MIP provides motorised focus and a sliding platform mechanism for the best precision and sample accessibility.

Cassette	ID image
EM grid cassette (for up to 3 standard 3.05 mm EM grids)	
Planchette Cassette Ø2.8-3mm	
FEI High NA Grid Cassette (Autogrid™)	
EM Grid Cassette for high NA objective	
Si <sub>3</sub> N <sub>4</sub> SQ Double Cassette, requires Cassette Transporter (9365)	
CryoCapsule Cassette	

## Contact

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We make scientific instruments that help characterise materials from polymers to biological tissue and metals to composites. Our instruments are used for research by the world's most advanced scientific organisations and companies. Each of our instruments are designed and manufactured in-house by our team of highly experienced electronics, software and mechanical design engineers. We design and develop solutions for sample characterisation by collaborating with the best scientists in the world. Will you be next?

*Linkam products are constantly being improved, hence specifications are subject to change without notice.*



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