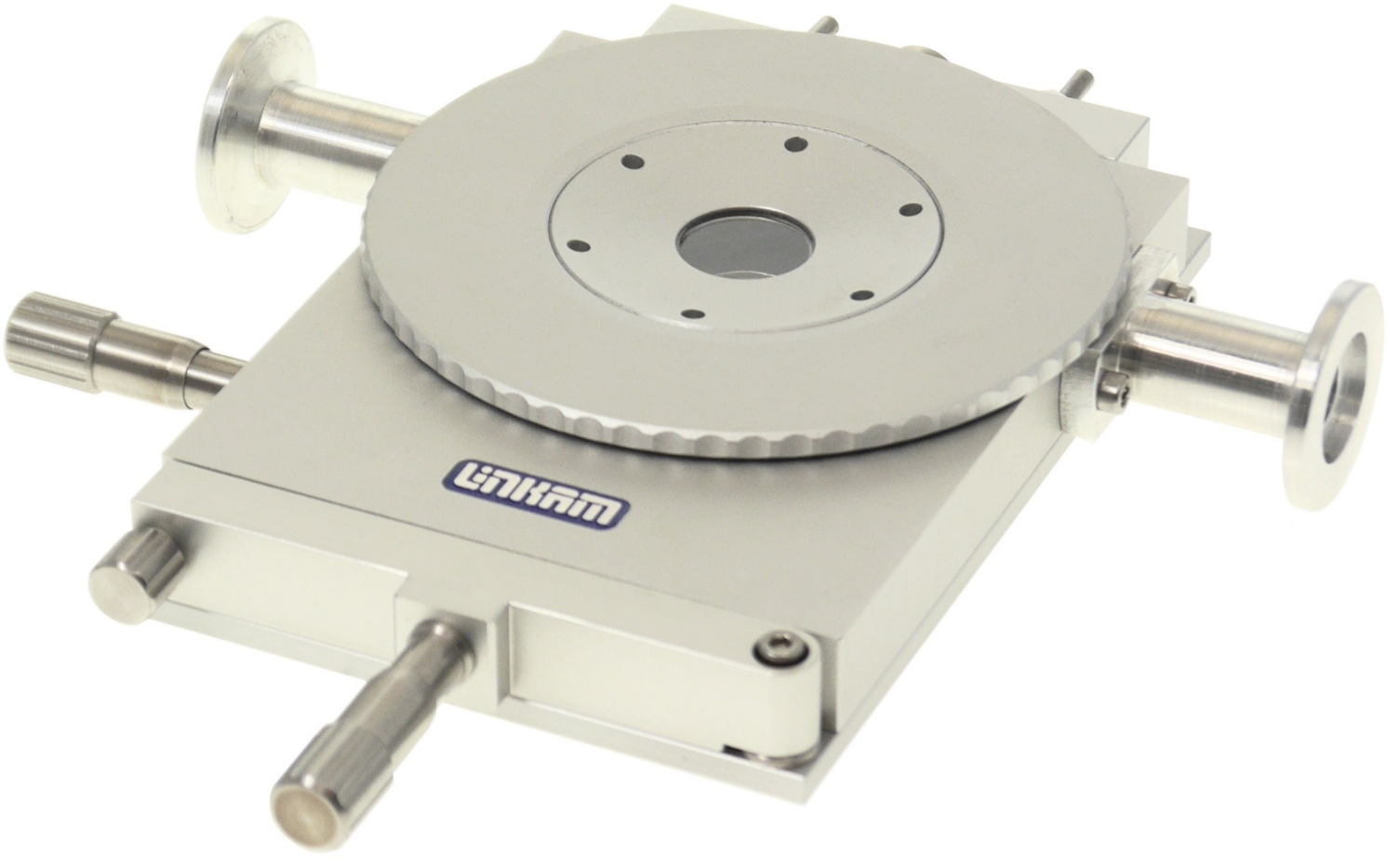
FDCS196

Lyophilisation System



Low Temperatures and Uniform Vacuum
Control temperature to -196°C and vacuum to 10^{-3}mbar

Small Sample Volume
Only requires ~5µl of sample, preventing the loss of APIs and saving on costs

Lyophilisation Imaging
High quality imaging throughout the entire freeze drying process

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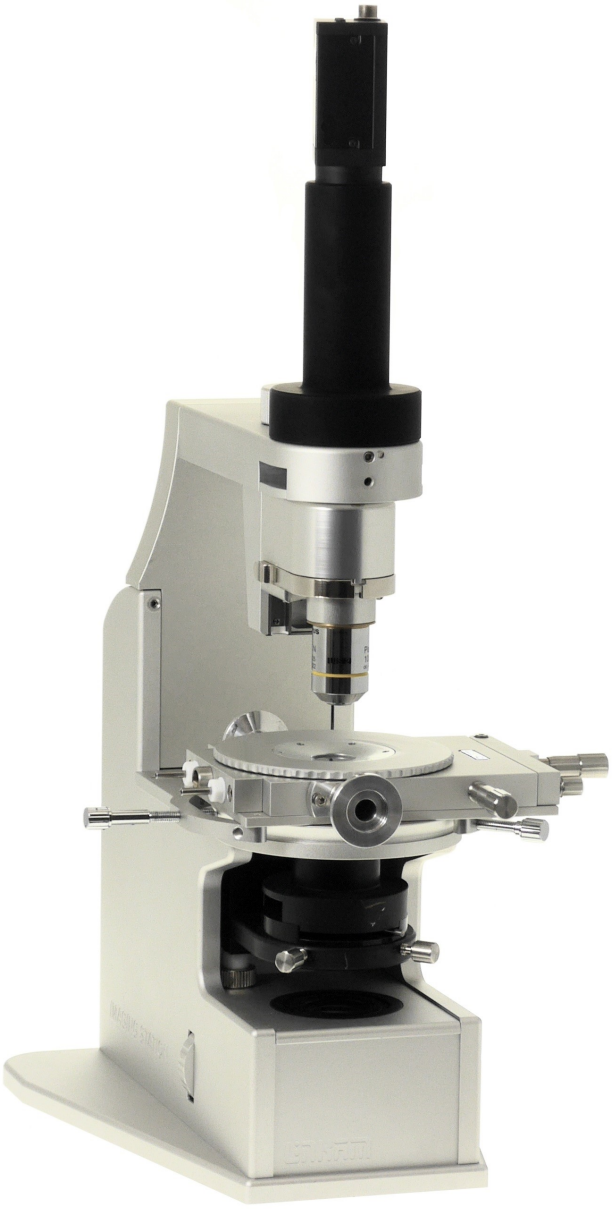
Introducing the FDCS196

Developing freeze drying protocols is a time consuming and expensive process which can be wasteful. With the FDCS196 you can quickly and accurately characterise your freeze drying protocol by precisely controlling sample temperature and stage vacuum pressure. The system provides a complete solution to meet your lyophilisation research requirements.

Using light microscopy techniques such as phase contrast and polarised light microscopy, it is now possible to swiftly and accurately determine collapse and eutectic temperature, and intricately investigate freeze dried structure of complex samples. Both stage pressure and temperature can be controlled and programmed to simulate industrial procedures and determine ideal drying parameters. The small sample volume of 5µL ensures minimal loss of APIs and helps save on research costs.

With a temperature range down to -196°C, ultra low temperature eutectics can be investigated with the FDCS196 system. Chamber pressure is monitored by a Pirani vacuum gauge mounted directly on the stage. The XY manipulators can be used to follow the drying front moving across the sample. Pressure can be automatically controlled by the Linkam MV196 motorised valve. A graph of temperature against time also shows the plot of the chamber pressure throughout the experiment.

Using LINK software, time lapse images of the freeze drying run with all the experimental data (temperature, time, date, pressure, magnification) are captured and imprinted onto each image. These images can be viewed in a gallery or as a movie with captions, containing all the data displayed underneath the viewing window.



Features

UNIFORM VACUUM
Chamber pressure is monitored by a Pirani vacuum gauge mounted directly on the stage which allows a perfectly uniform vacuum to be maintained

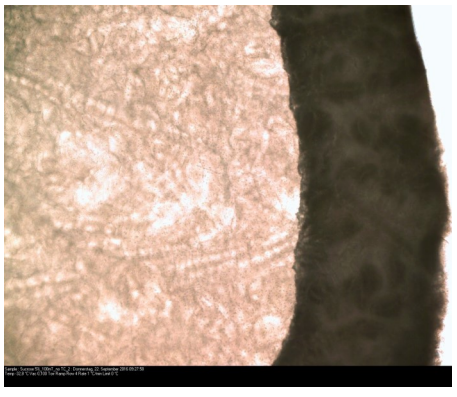
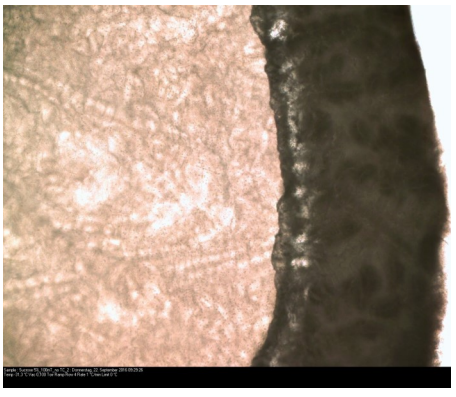
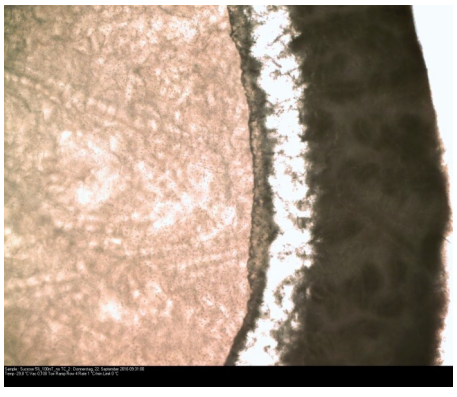
SIMULATE INDUSTRIAL PROCEDURES
Along with vacuum temperature (-196°C to 125°C) can be accurately controlled and programmed to simulate industrial procedures and determine ideal drying parameters. The process is quick and utilises small volumes of sample, ultimately reducing sample wastage and saving on costs.

LYOPHILISATION IMAGING
Using the imaging system module of LINK, create time lapse images and videos with experimental data imprinted on each shot. Use the XY manipulators to track and image the drying front.

AUTOMATIC PRESSURE CONTROL
Add ultimate control to your freeze drying system with Linkam's MV196 motorised valve. The optional MV196 receives pressure data through the T95 controller/LinkPad and controls vacuum within the stage.

SMALL SAMPLE VOLUME
With the FDCS196 you can observe the lyophilisation process using only ~5µL of sample which ensures minimal loss of APIs. This also helps save on research costs by reducing waste.

Application Examples

The sample pictures above, courtesy of Dr Zixin Huang, show the freeze drying process of 5% sucrose solution. The collapse of the product can be visualised and the temperature recorded, a parameter critical for the freeze drying process.

Testimonial

Dr Zixin Huang, University of Erlangen, *Research Group of Dr H. Giesler*

"The Linkam FDCS196 system provides a measurement condition, which is similar to the real freeze-drying. Thanks to this system, people can determine the critical formulation parameters and investigate of formulation behavior under various thermal conditions prior to freeze-drying process. The information obtained is essential for understanding the physicochemical characteristics of the formulations and designing an efficient freeze-drying cycle."

References

Eva Meister, Slobodan Šaši, and Henning Gieseler (2009) Freeze-Dry Microscopy: Impact of Nucleation Temperature and Excipient Concentration on Collapse Temperature Data.

Jingru Yi, Xin M. Liang, Gang Zhao, Xiaoming He (2014). An Improved Model for Nucleation-Limited Ice Formation in Living Cells during Freezing.

Technical Specification

Temperature Range	-196°C to 125°C
Heating Rate/Cooling Rate	150°C/min
Temperature Stability	<0.1°C
Condenser Lens Minimum Working Distance	12.5mm
Objective Lens Working Distance	4.8mm
Typical Sample Volume	~5µl
Vacuum	Up to 10^{-3}mbar
Compatibility	Confocal, Laser Raman, IR, X-ray, Imaging Station and 3rd party microscopes

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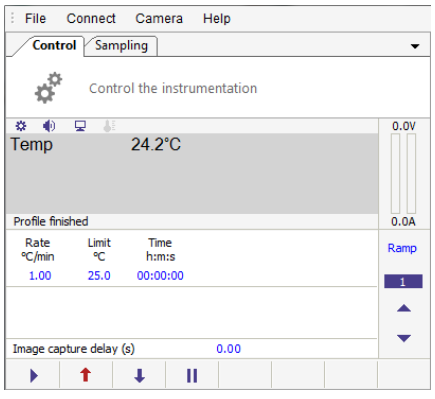

LINK Control Software

Take control of your experiment with the new LINK software. In addition to temperature, LINK can control or monitor many of the other stage parameters such as vacuum, humidity, tensile force and shear force (dependent of stage type and sensors). LINK can be programmed with up to 100 ramps and provides real time graphical feedback. LINK supports a number of modules to further enhance your system, including LINK Imaging Module for synchronised image capture, LINK Extended Measurements module for recording the measurement of key features in your images, LINK 21CFR11 Module for data regulatory compliance and LINK TASC providing image analysis based thermal analysis.

MV196 Motorised Valve

The motorised valve receives pressure data via the T95-LinkPad and controls the vacuum pressure inside the sample chamber. Specific vacuum values can be set as part of a temperature profile and the valve will automatically control the pressure. It will need a 2.5 m³/h rotary vacuum pump to function optimally.

Imaging Station

The Imaging Station is compatible with all Linkam heating and cooling stages. It has been specially designed with a pivoted mechanism to allow greater access to your samples. There are reflected and transmitted light options available and it is compatible with a range of long working distance objective lenses.

Contact Details

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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?

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