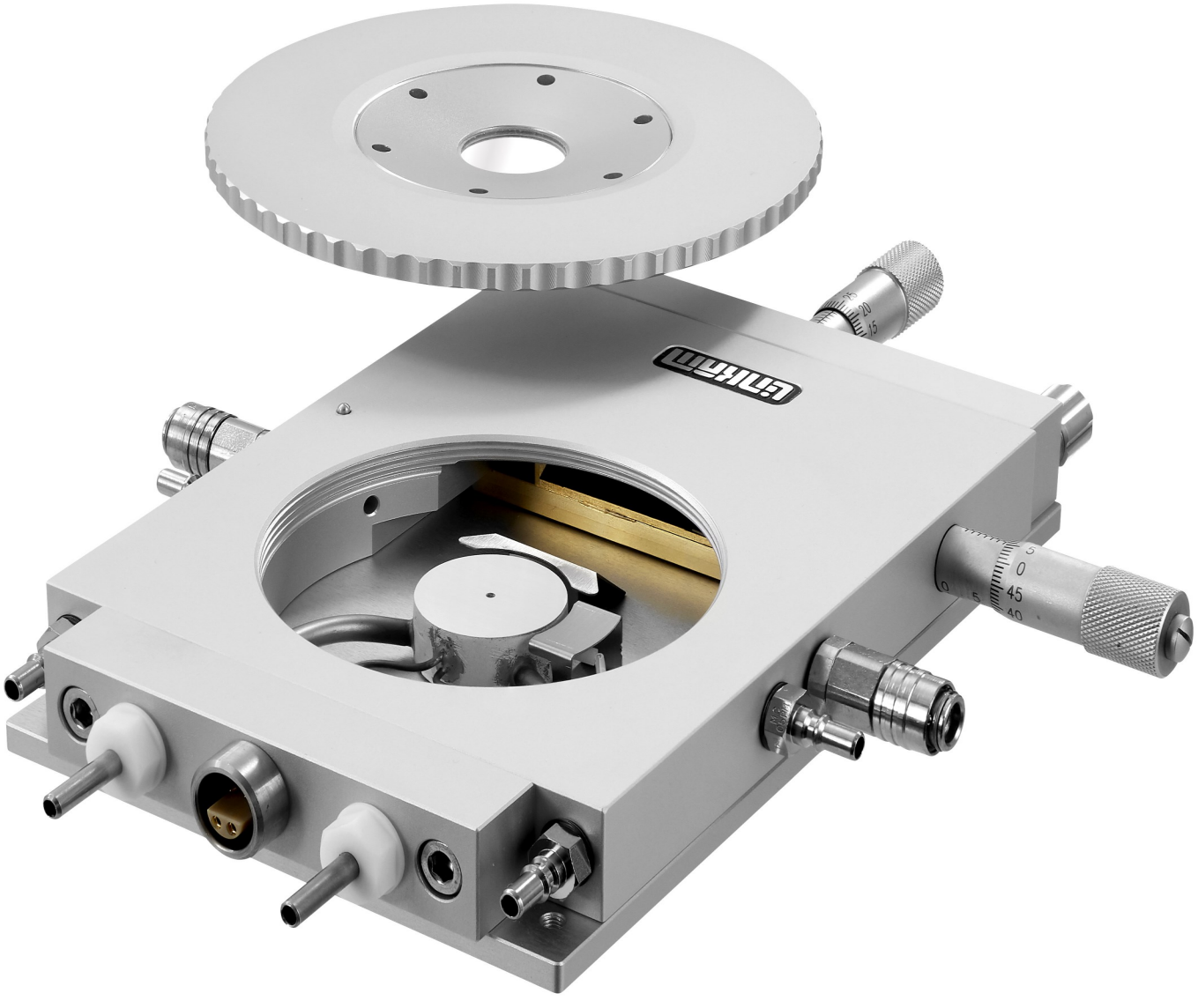
THMSG600

Heating and Cooling Stage Optimised for Geology



Heating and Freezing
Temperature range from < -195°C up to 600°C, heating rates from 0.01°C to 150°C/min

Optical Techniques
Supports confocal, Raman, light microscopy, X-ray and more

Optimised for Geology
System and accessories specially developed for earth science applications

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Introducing the THMSG600

The THMSG600 is based on the design of Linkam's highly successful THMS600 stage with modifications specifically for geological applications. It offers unrivalled temperature accuracy and control and can be found in fluid inclusion laboratories worldwide.

The sample is placed on a 7mm quartz cover slip; a pure silver lid can then be placed on top creating an oven to heat the sample from all sides and ensure a perfectly uniform temperature. Characterisation is performed by heating to within a few degrees of the required temperature at a rate of up to 150°C/min with minimal overshoot, then slowed down to a few tenths of a degree per minute to closely examine changes.

NEXUS software can be used to record the entire experiment and associated images, which can then be displayed as a chart or exported for further analysis.

A system requires the THMSG600 stage and a T96-S temperature controller, which is available with either NEXUS software for computer control, or a LinkPad touch screen for stand-alone control. For cooling below ambient temperatures, an optional LNP96-S liquid nitrogen pump is available.

Features

Wide Temperature Range
The temperature range spans from < –195°C (with the addition of an optional LNP96-S) up to 600°C for a versatile range of experiments. The stage body is water-cooled for work above 300°C.

Rapid Heating /Cooling Rates
The T96-S controller allows the stage to heat samples at a maximum rate of 150°C/min.

High Degree of Accuracy and Stability
The embedded high quality Pt100 platinum sensor guarantees high accuracy and stability throughout the temperature range.

Various Optical Techniques
Whether you need to perform Raman spectroscopy, X-ray microscopy or confocal, the THMSG600 can handle it.

Quick-release Gas Ports
Simple and easy stage purging to allow atmospheric composition control.

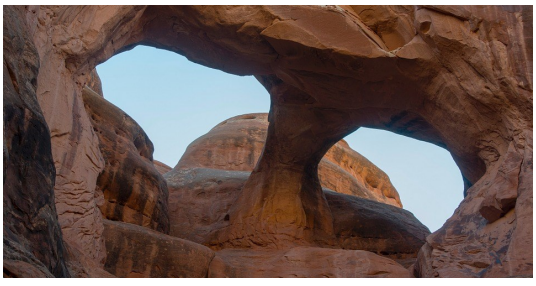
XY Manipulators
Sample position can be controlled over 15mm of travel in both X and Y directions via the precision ground manipulators.

Custom Options
Please contact us with details of your requirements.

Application Examples and Testimonials

The THMSG600 has been specifically designed for geological experiments and is ideal for many earth science and materials applications. Thermal and environmental control experiments are used in geological research, such as studies of dissolved gases or mineral content in geological fluids. The THMSG600 adds atmospheric control in combination with many microscopy and spectroscopic techniques.

Fluid Inclusions | Oxidation Studies | Thermal Maturation



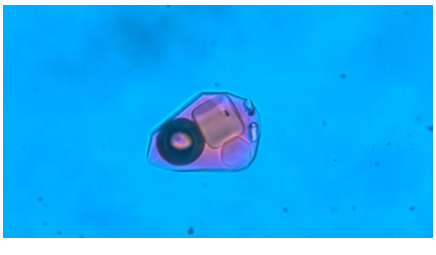
Professor Jamie Wilkinson
Natural History Museum and Imperial College London - Department of Earth Science & Engineering

THMSG600, MDSG600

"I have become more and more impressed with the Linkam family of temperature-controlled stages. They provide precise and accurate measurement capability, are designed with a small thermal mass so respond quickly and require small temperature calibration corrections. Not least is their ease of use (particularly where inexperienced undergraduate students are concerned). All are equally important to us.

The thermal masses of the stages (heating block and sample holders) are small and hence thermal equilibration rates are clearly very fast. This is evidenced by the virtually immediate response of an inclusion to a small step in temperature when close to a phase change such as final ice melting or CO_2 phase homogenization. Linkam's stages were ideal for this work."

J.J. Wilkinson *et al.* "1 Metastable Freezing: A New Method For The Estimation Of Salinity In Aqueous Fluid Inclusions nitride barriers" (2017) *Economic Geology* 112.1, 185-193 DOI: 10.2113/econgeo.112.1.185



A multiphase brine inclusion (approximately 30 microns in length) from the Boyongan copper -gold porphyry deposit in the Philippines, using the THMSG600. It shows a large halite (NaCl) cube, a smaller sylvite (KCl) cube and several other "daughter" crystals that have crystallised during cooling of the fluid after high temperature entrapment.

Dr. Chung-Cherng Lin
Institute of Earth Sciences, Academia Sinica, Taiwan

THMSG600, TS1500

"In our lab, most of the temperature experiments have been carried out by the combination of a Raman spectrometer with the heating stages from Linkam. The reliability of experimental results depends significantly on the accuracy in temperature measurement. These stages have good accuracy in temperature (e.g. uncertainty is smaller than one degree at 800°C) and are easy to use. Using these heating stages, we have obtained reliable frequency-temperature dependences for Raman bands of some minerals and compounds.

Temperature, pressure and composition are the three most important factors that influence the physical and chemical properties of a mineral inside the Earth. In addition to the study on the elastic properties of minerals and solid materials, the evolution of other physical properties with respect to temperature has been one of the subjects in my research."

W. Xue, C.C. Lin *et al.* "Effect of temperature on the Raman spectra of Ca5 (PO4) 3F fluorapatite" (2018) *European Journal of Mineralogy* 30.5 951-956 DOI: 10.1127/ejm/2018/0030-2769

The THMSG600 was used to study on the iso-structural alkaline earth phosphates, revealing that the variation rate with respect to the temperature in the Raman frequency of the internal modes of the PO_4 group increase with the increase of P-O bond energy.

Technical Specification

Temperature Range	< -195°C (with the addition of an optional LNP96-S) to 600°C
Heating/Cooling Rates	0.01°C to 150°C/min
Temperature Stability	<0.01°C
XY Manipulation	15mm in X and Y
Objective Lens Working Distance	4.8mm (solutions for shorter working distance lenses available on request)
Sample area	22mm diameter
Compatibility	Confocal, Laser Raman and X-ray. Clamping options are additionally available for most microscopes.

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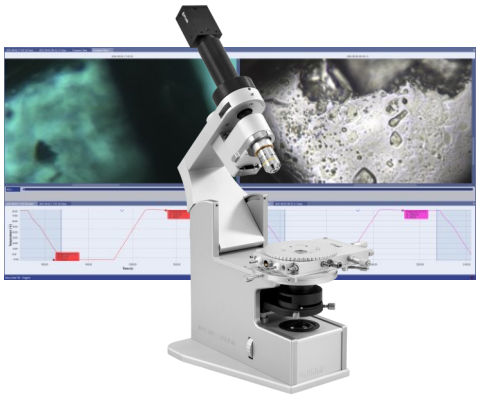
Discover More...

Control Options

Take control of your experiment with NEXUS software, or the stand-alone LinkPad touch screen, alongside the T96 temperature controller.

Both NEXUS software and a LinkPad can be used to control and monitor temperature and many other parameters including vacuum and humidity (dependent on system). The LinkPad provides an easy-to-use interface to the T96, for total control without a PC. Profiles with up to 100 ramps can be programmed, allowing simulation of complex processes.

NEXUS software enhances this with data-logging, rewind logged data and images to review whilst still recording, data run comparison tools, advanced triggering functions and real-time graphical feedback. Optional modules to enhance your system include the NEXUS Imaging Module for synchronised image capture, the NEXUS Extended Measurements Module to measure key image features, the NEXUS 21CFR11 Module for data regulatory compliance, the NEXUS Reporting Module to create reports in Microsoft Word and the NEXUS TASC Module for image-based thermal analysis.



Imaging Station

The Imaging Station provides a digital imaging platform compatible with Linkam temperature and environmental control systems. Use our high-resolution camera to capture images and videos of your samples while controlling the temperature and environmental conditions.

The Imaging Station has been specially designed with a pivoted mechanism to allow greater access to your Linkam stage, making it quick and easy to access the chamber and change samples. It has a built-in LED light source for transmitted light with further options available for reflected light, polarisation and phase contrast imaging.

The Imaging Station is also compatible with a range of long working distance objective lenses which can be easily switched with the quick-release mechanism.

MDSG600 - Motorised Geology Stage

The MDSG600 stage is the leading solution for unrivalled temperature accuracy and motorised sample positioning. Adapted from our MDSG600 for geological applications, sample temperature can be precisely controlled from < -195°C to 600°C.

The sample position can be controlled in both X and Y directions by precision micro-stepped motors. These enable micron resolution and position recall, so that a sample can be mapped in order to quickly relocate positions of interest and carry out temperature-controlled experiments significant to that point.

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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