

MDS600 - Motorized XY Heating/Freezing System

The MDS600 System is the top of the range solution for unrivalled temperature accuracy and motorized sample control.

Features and Benefits

The MDS600 is a motorized version of the THMS600, arguably the most popular heating/freezing stage in the world.

The sample is motorized in X and Y directions by precision micro stepped motors that enable micron repeatable position 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.

The response time to a 'Hold' or 'Limit' command where the temperature is stable to 0.1C is only 0.1 seconds at 30°C/min.

The heating element is held by transverse stainless steel tubes to ensure perfect stability in Z-plane critical to confocal applications.

High magnification 100X objectives with less than 4.5mm working distance can be used incorporating a special lid and cooling jacket setup which protects the lens at high temperatures.



The MDS600 heating and freezing stage

Temperature Range -196°C to 600°C

System Options

High Speed Controlled Cooling

The new LNP95 liquid nitrogen cooling system enables a vast range in cooling rates from 0.01 to 150°C/min. This highly efficient liquid nitrogen pump, using proprietary pumps and tubing, automatically controls pumping rate to ensure minimal liquid nitrogen is required and a consistent smooth cooling curve no matter which rate is selected.

Touch Screen User Interface

The new T95-LinkPad temperature controller with LCD touch screen control is used to quickly program a temperature profile by simply tapping the onscreen controls. Heating rates have also been increased up to 150°C/min to enable even faster characterization. To control the system from the PC and capture both data and digital images, upgrade the system by adding the intuitive Linksys 32X-DV software.

Intuitive Temperature Control Software

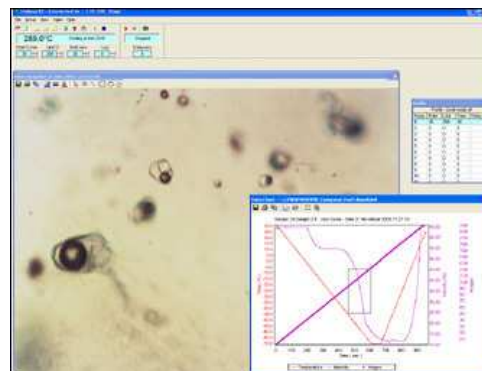
The Linksys system control software enables the user to quickly setup complex temperature control profiles.

Up to 100 ramps per profile, where each ramp sets temperature limit, heating/cooling rate and hold time. The profile can be saved for future use along with a temperature/time plot of the experiment.

Events within a temperature profile can be quickly examined by overriding the temperature profile using the on screen controls that mimic the touch screen of the LCD LinkPad.



Geology Pro System including LNP95 cooling system



Linksys 32X-DV System Controller Software

Optical Specifications

Objective Lenses

The MDS600 is designed to be used with an upright microscope, where the objective lens is above the sample.

When working with heating and freezing stages, it is necessary to use long working distance objective lenses. If viewing the sample using transmitted light you also require a long working distance condenser lens.

The objective lens is isolated from the sample by the stage lid window which is a fixed distance from the heating/cooling element. In the MDS600 this distance is 4.5mm, as seen in the diagram opposite. We recommend that you use an objective lens with at least 4.5mm working distance.

Condenser Lenses

The condenser lens is isolated from the sample by the stage base plate window and the thickness of the heating/cooling element. In the MDS600 this distance is 12.5mm.

Linkam make condenser extension lenses for many types of condenser, please select the 'Condenser Extension Lenses' from the 'Optical accessories' section of our website.

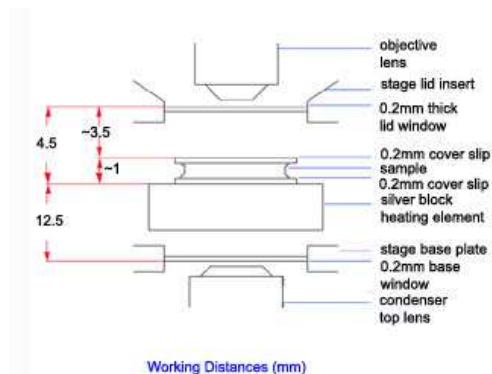


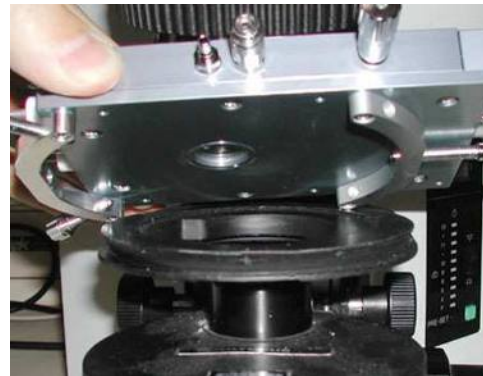
Diagram of objective lens and condenser lens working distances.

Attaching MDS600 to Microscope

Upright microscopes whether standard optical, or part of a Raman or IR system, usually have an XY table or circular rotating polarizing table to move the sample relative to the objective lens. These tables are mounted to the microscope substage and need to be removed when using the hotstage.

Linkam manufactures different stage clamps to attach the MDS600 stage to many different brands of microscope. The stage clamps are required to adjust the position of the hotstage relative to the light path of the objective lens and clamp it into place to prevent further movement during the experiment.

Select the stage clamps you require from the 'Selecting Stage Clamps' section on page 4 of this brochure.



THMSG600 stage with stage clamps being attached to circular dovetail substage.

Increase Capability Options

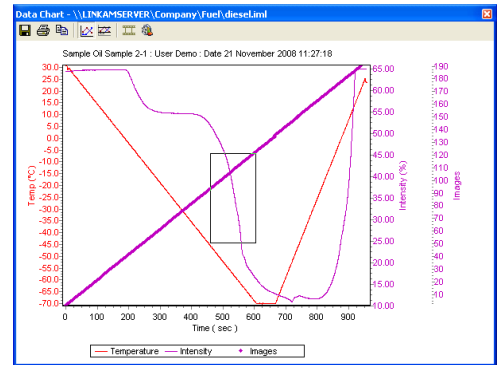
Linksys 32X-DV (Digital Image Capture) and Digital Camera

Add the DV digital video capture module to the Linksys 32X system controller software and one of the range of Q-Imaging digital cameras to enable both time lapse image and T95 data capture

Light intensity can also be measured and onset of crystallization can be quantitatively measured as a function of light intensity.

Quickly find individual or groups of images by dragging a box around an area of the time/temperature graph and loading the images and data into the scrollable gallery.

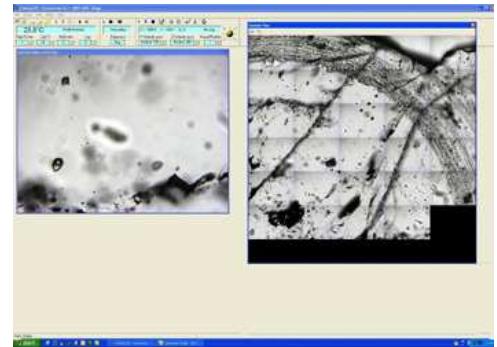
Create movies of experiments and add scale bar, annotations, and measurements to images. (See 'Software and Image Capture' on our website for more information).



Graph of temperature /time/images captured/light intensity.

XY Motorized Sample Position Control

By adding the Linksys 32X-DV option, the MDS600 can automatically scan the entire sample capturing high resolution images and constructing an image map. Points of interest can be instantly be relocated for further temperature control analysis by clicking on the specific area in the image map. This feature can save the researcher hours of manual sample mapping.



Motor driven image map of fluid inclusions in quartz.

Imaging Station

Free up time on your research microscope by attaching your MDS600 stage to the Linkam Imaging Station instead. The imaging station has been designed specifically for temperature controlled microscopy. Standard microscope lens can be loaded into the quick lock mounting jaws which can be easily swung back out of the way of the stage to allow greater sample access to the MDS600 stage. Optical performance is similar to a high grade research microscope.

A long working distance condenser is built into the base with polarizer and diaphragm. A 100W halogen light source and C-mount for a camera is also supplied. (See 'Imaging Station' on our website for more information).



Linkam Imaging Station. Optics are tilted back to allow easy access to sample

Specifications

- Temperature Range -196 °C to 600 °C
- Heating and cooling rates of 0.01 to 150 °C/min
- Positional resolution of motors 0.05µm
- Position repeatability <3µm
- 150 X,Y coordinates can be stored
- Max. 15mm motorized X,Y travel
- Manual & PC operation
- Definable sample scan area
- Sample vibration eliminated over entire range of speeds
- Ventilated bottom window to eliminate condensation
- Novel low profile lid design for rapid lens change
- Extremely efficient use of liquid nitrogen
- Mounts directly on microscope substage using stage-clamps
- Objective lens working distance - 0.1mm to 4.9mm
- Condenser lens minimum working distance 12.7
- Light aperture - 1.3mm Ø for accurate sample temperatures
- Optional lid and cooling jacket for high magnification lenses

Selecting Stage Clamps

Select a suitable Stage Clamp to mount to your microscope substage. Stage clamps are listed by microscope make and model.

Olympus Upright Microscopes

BX series — 9541 curved clamp

Nikon Upright Microscopes

E50i/55i, E400/E600 — 9541 curved clamp

LV100 with substage MBD65000 — 9773 adapter plate and clamps

Zeiss Upright Microscopes

Axiophot, Axioplan, Axioplan 2, Axioskop 2, Axioskop 40 — 9564 clamps

Axiolab, Axioskop & Axiotech — 9565 clamps

Axiomager — 9783 clamp ring

Leica Upright Microscopes

Leitz Ortholux 2 & Orthoplan — 9668 adapter plate

DMRX, DMRB and DMRB(A) — 9673 clamping plate

DMLB/M & ATC200 — 9541 curved clamp

DM1000, DM2000, DM2500, DM4000M, DM5000 and DM6000M — 9789 adapter plate and clamps

Linkam Complete Temperature Control Solution

What do you need for a complete solution

Select Stage

MDS600

Select Controller Option

Either T95-LinkPad standalone system controller

Or T95-Linksys PC interface and Linksys 32X system controller software

Add Cooling Option to extend range from Ambient to -196°C

LNP95 (includes tubing, 2L Dewar and siphon)

Add Condenser Lens if using transmitted light

See website 'Condenser Extension Lenses'

Add Stage Clamp to mount to microscope substage

See 'Selecting Stage Clamps' on the previous page to select clamps specific to your microscope.

Add System Control Software (Not necessary if T95-Linksys is selected.)

Linksys 32X, set up temperature control profiles, save and export data.

Add System Control software including the Digital Video Capture Option

Linksys 32X-DV, set up temperature control profiles, display live image, capture time lapse images with data. Requires digital camera

Add Q-Imaging Camera

Camera is required if Linksys 32X-DV is added to system. See website 'Q-Imaging Cameras'

Add Linkam Imaging Station

See website 'Imaging Station'

Suggested Spares

These spares are organised into convenient kits. Purchase a spares kit to avoid downtime with your stage and eliminate future shipping costs.

The MDS600 heating element is extremely durable if used carefully. However, it is made from pure silver which is a soft metal. It can be easily scratched, which will compromise the heat flow to the sample and reduce accuracy. The platinum temperature sensor is brittle and can be broken if cleaning is not carefully performed. We recommend a spare heating element to avoid downtime with your stage while element is being repaired.

Part No. Part Name Part Description

7500	MDS Kit	Full Replacement Spares Kit
	WGI	Water/Gas Valve Insert x2
	WVC	Water/Gas Valve Connector x2
	SRR	Silicon Rings for Lid and Base (Set of 4)
	TCH	Tube Clip Holder (for Nitrogen de-fogging stage lid tube)
	MDS/Q	Quartz crucible for use with MDS/CC
	MDS/CC	Crucible carrier for sample preparation
	LSR	Large stainless steel ring
	ACCE	Box of Glass Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10) x2
	W13G	13mm diameter glass cover slip for SCO assembly (box of 30)
	WT	Window Tool (for unlocking lid insert and base locking ring)
	LT	22mm Lock Tool
	HEXK	2.5mm Ball Driver Hex Key

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Part No. Part Name Part Description

22222	MDS Spare Windows Kit	Spare Windows for Lid, Base and samples
	ACCE	Box of Glass Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10) x2
	W13G	13mm diameter glass cover slip for SCO assembly (box of 30)
	SRR	Silicon Rings for Lid and Base (Set of 4)

Part No. Part Name Part Description

7502	WS Kit	Precision Temperature Sample Window (nor for polarised light work)
	W7S	7mm diameter Sapphire Sample Window (0.3mm thick) x20

Part No. Part Name Part Description

9552	MDSB	Spare Heating Element Assembly including Temperature Sensor
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Part No. Part Name Part Description

0998	ECP	Water Circulator Pump (stage body and window cooling) (220-240V)
0997	ECP	Water Circulator Pump (stage body and window cooling) (110-130V)