

## THMS600 Heating and Freezing Stage

The THMS600 is one of the most widely used heating and freezing stages on the market. Over 1000 stages have been sold around the world to date. The THMS600 is used in many applications where high heating/freezing rates and 0.1 °C accuracy and stability are needed.

### Features and Benefits

Samples loaded onto a 0.17mm thick cover slip are placed on a highly polished pure silver heating element to ensure excellent heat transfer and extremely sensitive temperature measurement. A platinum resistor sensor, accurate to 0.01 °C provides far more accurate and stable temperature signal that can be achieved with a thermocouple.

Sample position can be precisely controlled 15mm in XY directions via the precision ground gas sealed manipulators.

Samples can be quickly characterized by heating to within a few degrees of the required temperature at a rate of up to 100 °C/min with no overshoot, then slowed down to a few tenths of a degrees per minute to closely examine sample changes. The entire experiment can be saved as an online plot or exported to a spreadsheet application.

The stage body is fitted with quick-to-fit gas ports so that sample atmosphere can be controlled by gas flow and condensation eradicated by dry nitrogen gas purge supplied by the LNP95 cooling pump.



The THMS600 heating and freezing stage

Temperature Range -196 to 600 °C

### System Options

There are two versions of the standard THMS600 system, The only difference is that the THMSE600 has electrical connections in the sample chamber to enable you to make measurements on your sample during a heating/cooling run, such as resistivity, capacitance etc...

There are two different system controller options:

#### T95 LinkPad

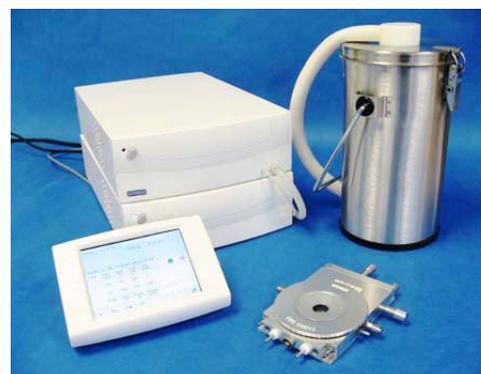
This system includes the excellent new standalone T95-LinkPad system controller with ergonomic LCD touch screen control and data sampling of 20 times per second. The controller has both USB and RS232 connectivity to add Linksys 32X system control software. See the T95 system controller Product Brochure for more details.

#### T95 LinkSys

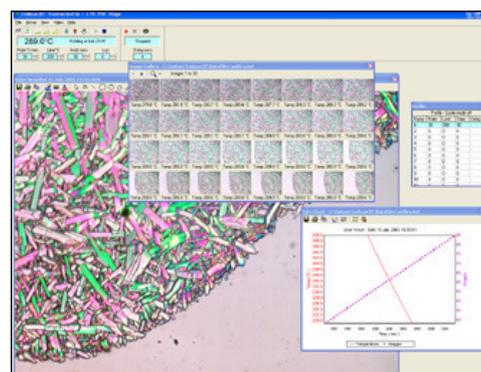
This system includes the new T95-Linksys system controller including new Linksys 32X system control software, enabling PC control of temperature, data acquisition and export as well as multiple ramp programming. (Requires PC, cannot be used as standalone controller).

#### Cooling

The LNP95 cooling pump communicates with the T95 system controller and varies the pump speeds to give a precise flow of liquid nitrogen from the 2L Dewar (supplied), to enable linear cooling speeds from 0.01 to 100 °C/min. The exhaust dry nitrogen is then recycled through the pumps and used to keep the tubing flexible and purge the sample chamber to eradicate condensation. (All fittings and Dewar are supplied with the pump).



THMS600 stage with T95 LinkPad and LNP95 cooling



Linksys 32X-DV System Controller Software

## Optical Specifications

The THMS600 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 THMS600 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.

The condenser lens is isolated from the sample by the stage base plate window and the thickness of the heating/cooling element. In the THMS600 this distance is 12.5mm.

Linkam make condenser extension lenses for many types of condenser, please select the condenser extension lens from the optical accessories section of our website.

## Attaching THMS600 to Microscope

Upright microscopes whether standard optical, or part of a Raman or IR system, usually have an XY table or circular POL 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 THMS600 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.

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

## Increase Capability Options

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

Add digital capture to the Linksys 32X system controller software and one of the range of Q-Imaging digital cameras to enable time lapse image capture including all T95 data saved with the image. Quickly find single or groups of images by dragging a box around an area of the time/temperature graph or scrolling through the gallery. Create movies of experiments and add scale bar, annotations, and measurements. (See '[Software and Image Capture](#)' on our website for more information).

### Imaging Station

Free up time on your research microscope by attaching your THMS600 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 THMS600 stage.

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).

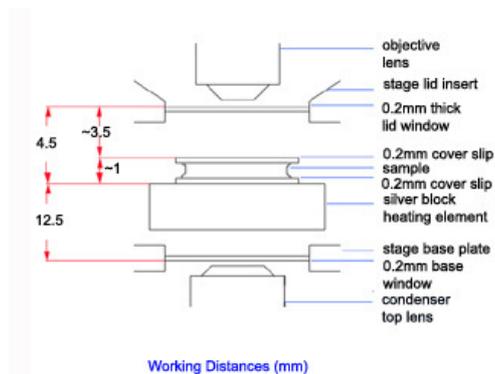
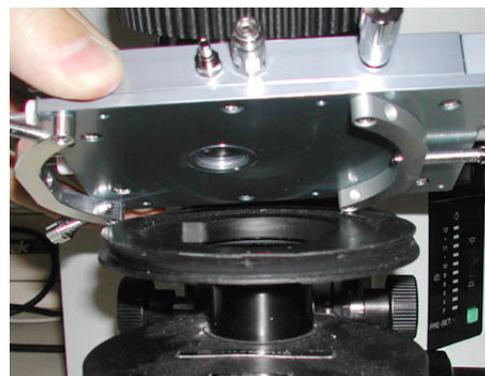


Diagram of objective lens and condenser lens working distances.



THMS600 stage with stage clamps being attached to circular dovetail substage.



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

## Specifications

- Temperature range -196°C to 600°C (LNP95 required)
- Up to 150°C/min heating
- Temperature stability <0.1°C
- 16mm XY sample manipulation
- Sample area 22mm diameter
- Gas tight chamber for atmospheric control
- 100 Ohm platinum resistor sensor
- Light aperture: 2.4mm diameter
- Silver heating block for high thermal conductivity
- Direct injection of the coolant into the silver block
- Single ultra thin lid window: 0.17mm
- Objective lens working distance: 4.5mm
- Condenser lens minimum working distance: 12.5mm
- Range of condenser extension lenses available
- Can be used with all microscope techniques
- Water cooled stage body for high temperature work (>300°C)
- Suitable for Confocal, Laser Raman and X-Ray
- Sample side loading without removing the stage lid

**Read on to see what you need for the complete Linkam temperature control solution.**

## 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 — 9542 curved clamp

U-SRP Polarising Table — 9654 SRP adapter plate

### *Nikon Upright Microscopes*

Microphot — 9675 Nikon Microphot Adapter

Optiphot 2 Pol — 9669 clamping plate

E800 — 9674 clamping plate

Optiphot 1/2, Labphot 2 — 9542 curved clamp

LV100 with substage MBD65000 — 9775 adapter plate

80i/90i with substage for Mechanical stage (not rotatable) — 9785 adapter plate and clamps

80i/90i with Rotatable Mechanical stage — 9564 adapter plate

Pol Table — 9654 clamping plate

### *Zeiss Upright Microscopes*

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

Axiolab, Axioskop & AxioTech — 9565 clamps

Axiomager and Axio Scope — 9734 adaptor plate and clamp

### *Leica Upright Microscopes*

Leitz Ortholux 2 & Orthoplan — 9667 clamping plate

Leitz Metallux 3 — 9671 clamping plate

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

Laborlux — 9677 clamping plate

DMLP — 9676 clamping plate

DMLB/M & ATC200 — 9542 curved clamp

DM1000, DM 2000, DM2500, DM4000M, DM5000 and DM6000M — 9670 clamping plate  
(Fits onto XY table part 11561090. Also fits DM2500M with Leica XY table part 11888705)

DM2500-P — 9654 clamping plate

DM1000, DM2000, DM2500, DM4000M, DM5000 and DM6000M — 9787 adapter plate and clamps

### *Other*

Biorad FTS-175C adapter — 9678 adapter

Meiji microscopes — 9679 adapter

Perkin Elmer Auto Image microscope — 9680 adapter

Marzhauser 116x116 Adapter — 9805 adapter

(This is suitable for the Marzhauser Scan 75x50 table, which has a recess of 116x116mm.)

## **Linkam Complete Temperature Control Solution**

**What do you need for a complete solution**

### **Select System**

Either THMS600 stage without internal electrical connections

Or THMSE600 with internal electrical connections

### **System Controller Options**

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 $-196^{\circ}\text{C}$**

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 THMS600 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.

The Precision Temperature Kit, is used to get extremely accurate temperatures. A highly conductive sapphire window is used with a special sample holder and covered with a pure silver lid to create a micro oven around the sample. This technique ensures the sample is heated on all sides and will yield the most accurate temperature control available.

### Part No. Part Name Part Description

<b>7512</b>	<b>THMS Kit</b>	<b>Full Replacement Spares Kit</b>
	WG	Water/Gas Valve Insert <b>x2</b>
	WVC	Water/Gas Valve Connector <b>x2</b>
	SSR	Silicon Rings for Lid and Base (Set of 4)
	RI17	Stainless Steel Ring Set
	THC	Tube Clip Holder (for Nitrogen de-fogging stage lid tube)
	ORTHMS	Set of O-Rings for THMS Stage Body and Lid
	THMS/Q	15mm diameter Quartz Crucible for THMS/CC
	ACCE	Box of Glass for Windows / Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10) <b>x2</b>
	THMS/CC	Crucible Carrier for THMS600
	TUBE	3x6x150mm Clear PVC Tube
	WT	Window Tool (for unlocking lid insert and base locking ring)

### Part No. Part Name Part Description

<b>7522</b>	<b>THMS Spare Windows Kit</b>	<b>Spare Windows for Lid, Base and Samples</b>
	THMS/Q	15mm diameter Quartz Crucible for THMS/CC
	ACCE	Box of Glass for Windows / Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10) <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)

## Suggested Spares

<b>Part No.</b>	<b>Part Name</b>	<b>Part Description</b>
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<b>7523</b>	<b>W/S</b>	<b>Precision Temperature Kit</b>
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G7	Sample Carrier for 7mm diameter Straight Edge Window
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W7S	7mm diameter Sapphire Sample Window (0.3mm thick) <b>x10</b>
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SCO	Silver Cover Lid
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<b>Part No.</b>	<b>Part Name</b>	<b>Part Description</b>
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<b>9500</b>	<b>THMSB</b>	<b>Spare Pure Silver Heating Element incl. Platinum Temperature Sensor</b>
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