

THMS600 Heating and Freezing Stage

The THMS600 is one of the most widely used heating and freezing stages on the market. Over 4000 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 0.1°C provides far more accurate and stable temperature signal that can be achieved with a thermocouple.

Sample position can be precisely controlled 16mm in XY directions via the precision ground manipulators.

Samples can be quickly characterized by heating to within a few degrees of the required temperature at a rate of up to 150°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-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.

System Options

There is an electrical connection version of the standard THMS600 system, The only difference is that this version, 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

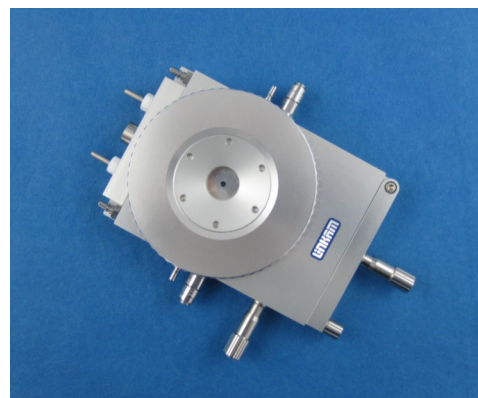
This system includes the excellent new standalone T95-LinkPad system controller with ergonomic LCD touch screen control and data sampling of 20 times per second. The controller has both USB and RS232 connectivity to add Linksys 32 system control software. See the T95 system controller Product Brochure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

T95 LinkSys

This system includes the new T95-Linksys system controller including new Linksys 32 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 0.1 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).

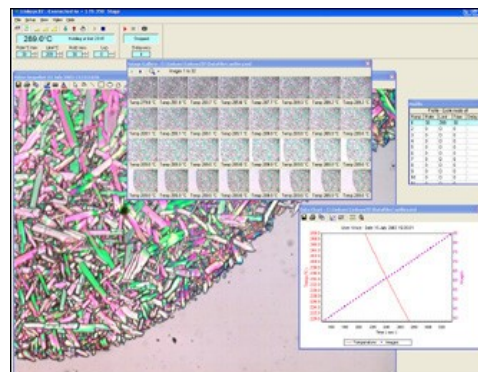


The THMS600 heating and freezing stage

Temperature Range -196 to 600°C



THMS600 stage with T95 LinkPad and LNP95 cooling



Linksys 32-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 6 of this brochure.

Increase Capability Options

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

Add digital capture to the Linksys 32 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).

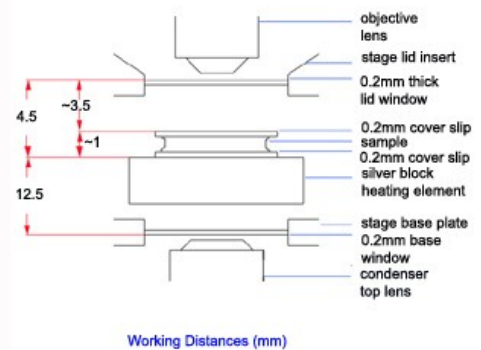
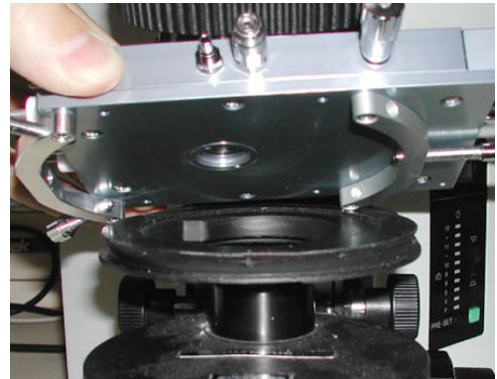


Diagram of objective lens and condenser lens working distances.



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
- Quick-fit gas ports for atmospheric control
- 100 Ohm platinum resistor sensor
- Light aperture: 2 mm diameter
- Silver heating block for high thermal conductivity
- Direct injection of the coolant into the silver block
- Single ultra thin lid window: 0.3mm
- 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.

Linkam Complete Temperature Control Solution

1) **Select System**

11002 THMS600 stage without internal electrical connections

11003 THMSE600 with internal electrical connections

2) **Add Controller**

14065 T95-LinkPad standalone system controller

14066 T95-Linksys PC interface and Linksys 32 system controller software

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

14050 LNP95 (includes tubing, 2L Dewar and siphon)

4) **Add an ECP if using the stage above 300°C**

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

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

0995 ECP Water Circulator Pump (stage body and window cooling)(220V,60Hz)

0977 ECP Water Circulator Pump (stage body and window cooling)(100V,60Hz)

5) **Add Condenser Lens if using transmitted light**

See website 'Condenser Extension Lenses' <http://www.linkam.co.uk/condenser-extension-lenses/>

6) **Add Stage Clamp to mount to microscope substage**

See 'Selecting Stage Clamps' on page 6 to select clamps specific to your microscope.

7) **Add System Control Software (not necessary if T95 LinkSys controller is selected).**

15001 Linksys 32

or if you require image capture,

8) **Add System Control software including the Digital Video Capture Option**

Please note that Linksys32DV software is compatible only with Linkam cameras

15005 Linksys 32DV or

15013 Linksys 32DV add-on (if T95 Linksys selected in step (2))

9) Add Q-Imaging Camera

5719 QIC-F-CLR-12 QICAM Fast 1394 non-cooled CCD Colour - Bayer Mosaic, 12-bit camera

Or see website 'QImaging Cameras' for more options— <http://www.linkam.co.uk/cameras/>

10) Add Linkam Imaging Station

Alternative to be used in place of your existing microscope for temperature controlled microscopy. See website 'Imaging Station' <http://www.linkam.co.uk/imaging-station/>

See the next page for clamps for your system.

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

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.)

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.

Please quote **part number** when ordering.

| Part No. | Part Name | Part Description |
|-----------------|------------------|---|
| 7512 | THMS Kit | Full Replacement Spares Kit |
| 2013 | | Box Glass Windows-Standard consisting of: 50x 22x0.17mm Glass 50x 16x0.17mm Glass 10x 22x0.3mm Glass |
| 2015 | | Standard Accessory Bag consisting of: 1x 3x6x150mm Clear PVC Tube 4x Silicone Washer 22x18x0.5mm 2x Hose Straight - WGI 2x Hose Valve - WVC 1x Universal Lock Tool |
| 2220 | | Standard Sample Slide |
| 2231 | | Tube Clip |
| 2252 | | Large sample ring |
| 2624 | | THMS O Ring Kit consisting of: 4x Silicone Washer 22x18x0.5mm 1x ID31.47 x CS1.78mm Nitrile 1x 41.00x1.78mm O-Ring 1x 75.94x1.78mm O-Ring 1x 76.0x3.0mm O-Ring |
| 2694 | | 2x 22x0.5mm Quartz Window |
| 3433 | | Quartz Crucible |

Please see next page for further options

Suggested Spares

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.

Please quote part number when ordering.

| Part No. | Part Name | Part Description |
|-----------------|-------------------------------|---|
| 7522 | THMS Spare Windows Kit | Spare Windows for Lid, Base and Samples |
| | 2013 | Box Glass Windows-Standard consisting of: 50x 22x0.17mm Glass 50x 16x0.17mm Glass 10x 22x0.3mm Glass |
| | 4 x2061 | Silicone Washer 22x18x0.5mm |
| | 2694 | 2x 22x0.5mm Quartz Window |
| | 3433 | Quartz Crucible |
| 7523 | W/S | Precision Temperature Kit |
| | 2222 | 1x 2222 G7T Sample Slide |
| | 2355 | 1x 2355 Silver Cover - SCO |
| | 3430 | 10x 7x0.3mm Sapphire |
| 9500 | THMSB | Spare Pure Silver Heating Element incl. Platinum Temperature Sensor |
| 2220 | THMS/CC | Crucible Carrier for THMS600 |
| 3433 | THMS/Q | 15 mm inner diameter Quartz Crucible for THMS/CC |
| 9526 | THMS/LCC | Liquid Crystal Cell Carrier |
| 2149 | LCC5 | Liquid Crystal Cell (5um gap, anti parallel aligned, capillary fill) |