

THMS350V Vacuum System

The THMS350V stage enables the user to create low pressure environment during complex heating and cooling profiles. Pressure is measured directly on the sample chamber and displayed in software or on the T95-LinkPad LCD screen.

Features and Benefits

Based upon the proven low pressure and temperature control technology developed for the Freeze Drying System (FDSC196), Linkam has modified the stage body and temperature control element to extend the temperature range from -196°C up to 350°C at a vacuum of 10^{-3} mbar using a simple 2.5 m³/h rotary vacuum pump.

It is now possible to carry out ultra low temperature experiments with virtually no gas or air contamination of the sample. By substituting a vacuum port for a gas valve it is also possible to first pull a vacuum and then bleed in the desired gas.

A Pirani gauge can be supplied to relay the sample chamber pressure to either the Linksys 32 software or the LCD touch screen on the T95-LinkPad Controller.

By connecting the vacuum pump to the MV196 motorized valve, pressure can be quickly and accurately varied utilizing simple on screen software controls.

System Options

There are two Vacuum System Options.

THMS350V Vacuum System

This system includes the THMS350V stage, T95-LinkPad Controller with ergonomic LCD touch screen control, Pirani vacuum gauge.

THMS350V Vacuum Pro System

This system includes the same components as the standard system above, but adding the Linksys 32 system control software, MV196 motorized valve and 2.5 m³/h rotary vacuum pump (including all vacuum connectors).

Cooling Option—LNP95

To cool samples from ambient down to -196°C, add the LNP95 liquid nitrogen cooling system. This highly efficient liquid nitrogen pump, using proprietary pumps and tubing, automatically controls pumping rate to ensure minimal liquid nitrogen is required.

There are two versions of the standard THMS350V Stage, The only difference is that the THMS350EV 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.

Please talk to Linkam if you require this option



The THMS350V heating and freezing vacuum stage

Temperature Range -196 to 350°C



THMS350V with Vacuum Gauge attached.



THMS350V system with Cooling option

Optical Specifications

The THMS350V 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 THMS350V 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 THMS350V this distance is 13.2mm.

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 THMS350V 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 sub-stage and need to be removed when using the hot-stage.

Linkam manufactures different stage clamps to attach the THMS350V stage to many different brands of microscope. The stage clamps are required to adjust the position of the hot-stage relative to the light path of the objective lens.

Select the stage clamps you require from the 'Optical Accessories' section on our website.

Specifications

- Temperature range -196°C* to 350 °C (*with LNP cooling pump)
- Up to 30°C/min heating/cooling
- Temperature stability <0.1°C
- 100 Ohm platinum resistor sensor for accurate measurement
- Direct injection of the coolant into the heating element
- 16mm XY sample manipulation
- Sample area 22mm diameter
- Vacuum tight sample chamber to 10⁻³mbar even with XY manipulation
- Single ultra thin lid window 0.3mm
- Hot-stage clamps directly to the microscope sub-stage for stability
- Objective lens working distance: 4.5mm
- Condenser lens minimum working distance: 13.2mm
- Range of condenser extension lenses available
- Can be used with all microscope techniques
- Suitable for Confocal, Laser Raman, IR and X-ray
- Stage body size: 137x92x22 mm

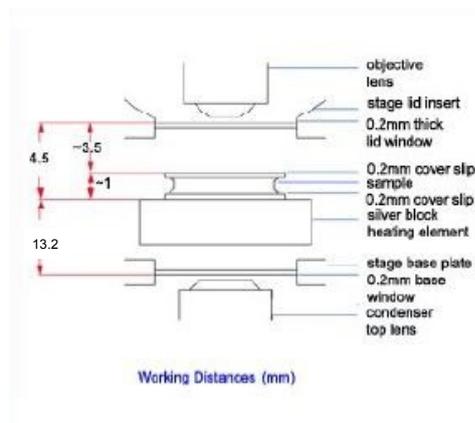
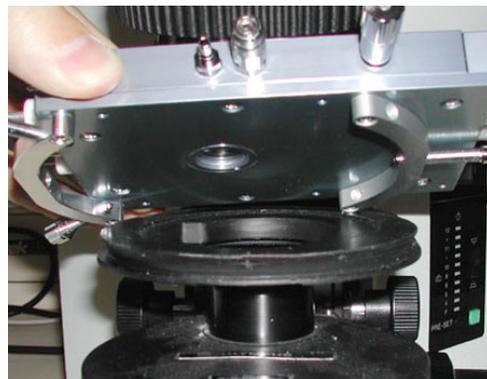


Diagram of objective lens and condenser lens working distances.



Hotstage similar to THMS350V with stage clamps being attached to circular dovetail substage.



Pirani Vacuum gauge connections with THMS350V stage

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.

Setup up your temperature profile and pressures for your lyophilisation cycle and leave the software to control the stage and captures images, enabling you to carry on with other tasks.

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. For more information, see 'Software and Image Capture' on our website.

Q-Imaging Cameras

Linkam supports the entire range of Q-Imaging CCD firewire cameras.

The QICAM fast 1394 shown here is designed for high resolution brightfield scientific and industrial applications. A progressive scan interline CCD sensor gives a resolution of 1.4 million pixels in 12-bit digital output.

This camera is ideally suited to the polarized colourful images seen in many of the birefringent crystalline structures seen in freeze drying.

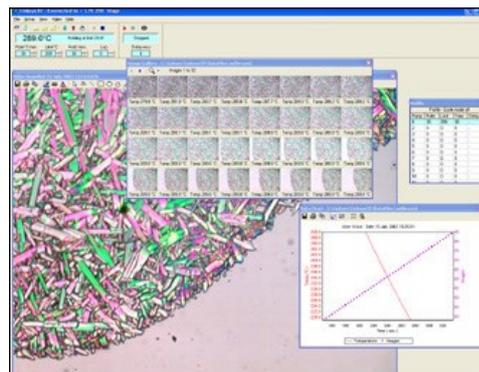
MV196 Motorized Valve

A motorized valve receives pressure data via the T95-LinkPad and controls the vacuum pressure inside the sample chamber. You can dial in a specific vacuum value as part of a temperature profile and the valve will automatically control the pressure. You will need a 2.5 m³/h rotary vacuum pump for this valve to function optimally. (Including with the Pro system).

Imaging Station

Free up time on your research microscope by attaching your THMS350V 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 THMS350V 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).



Linksys 32-DV System Controller Software



QICAM Fast 1394 non-cooled CCD Colour - Bayer Mosaic, 12-bit camera

Or see website for more options.



Rotary vacuum pump



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

Linkam Complete Temperature Control Solution

1) Select System

10086 THMS350V Vacuum Hotstage System

Comprising of THMS350V stage (2 ports), T95-LinkPad Standalone System Controller

Pirani Vacuum Gauge with cable to T95-LinkPad Standalone System Controller

2xNW16 O'ring, 2xNW16 Clamping Ring and Linksys32 Software

OR

10095 THMS350MV Vacuum Hotstage Pro System

Comprising of THMS350MV stage (2 ports), T95-LinkPad Standalone System Controller

Pirani Vacuum Gauge with cable to T95-LinkPad Standalone System Controller

Linksys32 Software, 2.5 m³/h Vacuum pump including Mist Filter,

Motorised vacuum control and 500mm Stainless Steel Flexible Hose.

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

14052 LNP95 (includes tubing, 2L Dewar and siphon)

3) Add Condenser Lens if using transmitted light

See website 'Condenser Extension Lenses'

4) Add Stage Clamp to mount to microscope substage

See 'Selecting Stage Clamps' on page 5 to select clamps specific to your microscope.

5) Add on the Digital Video Capture software option

15013 Linksys 32DV add-on

Please note that Linksys32DV software is compatible only with Linkam cameras

6) 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—

7) Add Linkam Imaging Station

An ergonomic alternative to be used in place of your existing microscope for temperature controlled microscopy. See website 'Imaging Station'

Note:

If the Motorized Valve MV196 is purchased as an upgrade to the 10086 THMS350V Vacuum Hotstage System at a later date, then the T95-LinkPad controller will have to be returned to the Linkam factory to be modified to enable control of the valve.

Selecting Stage Clamps

Select a suitable Stage Clamp to mount to your microscope substage. Stage clamps are listed by microscope make and model. Please contact Linkam if your microscope is not on this list.

Olympus Upright Microscopes

BX series — 9542 curved clamp

Nikon Upright Microscopes

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

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

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

DMLB/M & ATC200 — 9542 curved clamp

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

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 THMS350V cooling 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
10031		Motorised Vacuum Control Option
		MV196 Motorised Valve
		VC95 Vacuum Controller expansion card (inserted in to T95 controller)
		NW10 T-Piece
		3xNW10 O'ring
		3xNW16 Clamping Ring
7505		Vacuum connection kit
		10mm bore vacuum O-ring
		16mm bore vacuum O-ring
		3 x Clamping Ring
		500mm stainless steel flexible hose
		10 to 16mm bore vacuum O-ring
		NW10 Elbow 90 degree
		Vacuum grease
9859	Vacuum gauge	Pirani Vacuum Gauge (Edwards) for T95V
3433	THMS/Q	15 mm inner diameter Quartz Crucible for THMS/CC
9811	Spare heating block	THMS350V spare heating block with sensor
9824		Set of two 33mm Vacuum Ports
9825		Set of two 43mm Vacuum Ports

Suggested Spares cont'd

Part No.	Part Name	Part Description
9838		Set of two 55mm Vacuum Ports
19103		Vacuum simulation plug
8117		Vacuum Grease (tube)
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