

## Probe Systems for Microscopy and Spectroscopy

There are many applications that require the measurement of electrical parameters whilst making microscopic or spectroscopic observations. Linkam have designed a range of heating and freezing stages with electrical connectors and probes specifically aimed at areas of research such as MEMS, silicon wafer and liquid crystal materials. These instruments incorporate the new T95 controller technology giving the excellent temperature control expected of Linkam products.

### Features and Benefits

- Superb temperature control whilst making electrical measurements on samples
- Ductile gold-tipped tungsten probes can be formed to shape
- Magnetic bases for easy and stable positioning of probe assembly
- Multi-pin LEMO or BNC connectors
- Compact design
- Can use different inert gases to control the atmosphere
- Easy sample loading
- Suitable for microscopy or stand-alone applications

### Systems

#### LTS120E-PL8 Probe System

This complete system is based on the LTS120E peltier stage with a 40mm x 40mm heating area and includes the excellent new PE-LinkPad stand-alone system controller with data sampling of 20 times per second— see the T95 system controller Product Brochure for more details. With a temperature range of  $-40^{\circ}\text{C}$  to  $+120^{\circ}\text{C}$  and temperature stability of  $0.1^{\circ}\text{C}$

#### HFS600E-PB4 stage

The HFS600E-PB4 heating/freezing stage incorporates 4 probes and 4 BNC connectors. With a temperature range of  $-196^{\circ}\text{C}$  (when used with the LNP95) to  $+600^{\circ}\text{C}$  this is a versatile instrument, which can be supplied as a variants for high pressure work or using in a vertical orientation (in spectrometers).

#### LTSE stages

Based on the successful LTS chamber format with its sliding lid and large-area heater, there are several options available; temperature ranges of  $-196^{\circ}\text{C}$  (with the LNP95) to  $+350^{\circ}\text{C}$  or  $196^{\circ}\text{C}$  (with the LNP95) to  $+420^{\circ}\text{C}$ , with Lemo or BNC connector options

#### Temperature controller

With the introduction of the T95 controllers, the probe stages have benefited from improved temperature stability and precision. All probe stages can be supplied with either the T95 LinkPad stand-alone, or T95-Linksys computer controller.

#### Liquid Nitrogen System

For experiments at temperatures below ambient, or fast cooling experiments from  $100^{\circ}\text{C}$  downwards, then the compact LTS-LNP95 system is required on all probe stages except the LTS120E-PL8 Probe system.

#### Water Cooling

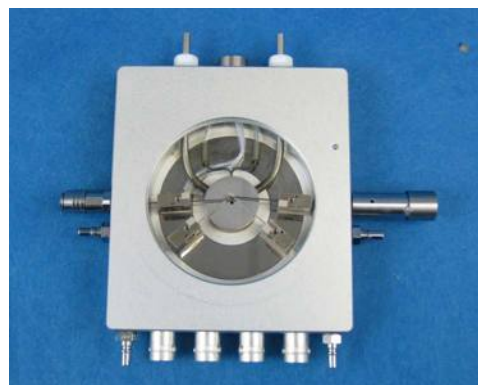
For working at temperatures above  $300^{\circ}\text{C}$  for prolonged periods then use the ECP water circulator pump to keep the stage body cool.



The LTS420E-P system with optional LNP95 giving a temperature range of  $-196^{\circ}\text{C}$  to  $420^{\circ}\text{C}$ . This system configuration includes the T95 touchscreen for stand-alone experiments



The LTS120E-PL8 Peltier heated/cooled probe stage with temperature range of  $-40^{\circ}\text{C}$  to  $+120^{\circ}\text{C}$ , fitted with spring post connectors and LEMO feed-throughs.



HFS600E-PB4 with temperature range of  $-196^{\circ}\text{C}$  (with LNP95) to  $600^{\circ}\text{C}$ , fitted with BNC feed-throughs. This variant fitted with a pressure relief valve can be pressurised up to 14 bar.

## LTS120E-PL8 Probe System

The LTS120E-PL8 peltier controlled heating/freezing stage provides a complete solution in one package. It is supplied with the new PE95 system controller and ECP water circulator. An ideal system for those experiments requiring a lower range of temperature. As with all Linkam heating stages it can be fitted to most research grade microscopes and it can be supplied with additional windows for UV/IR/x-ray work.

### Features and Benefits

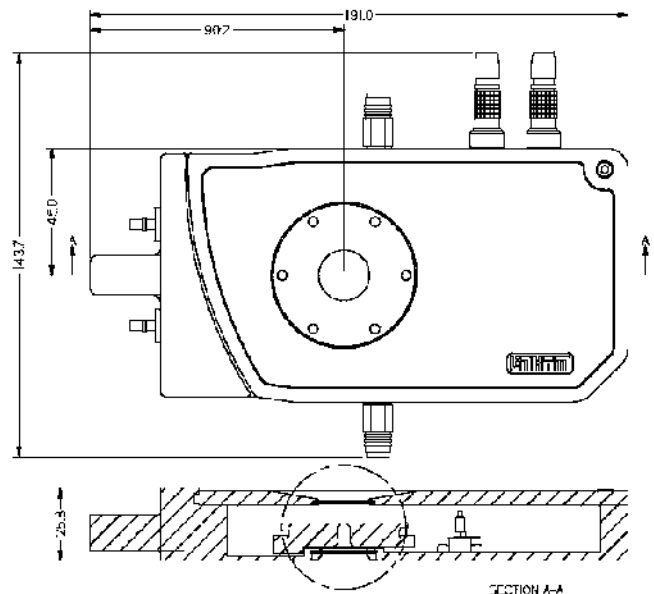
- Large sample format
- No liquid nitrogen required for cooling
- Cost effective system

### Specifications

- Temperature Range  $-40^{\circ}\text{C}^*$  to  $120^{\circ}\text{C}$
- Maximum heating / cooling rate of  $30^{\circ}\text{C}/\text{min}$
- Temperature stability & accuracy to  $0.1^{\circ}\text{C}$
- Response time of  $<1$  second at  $5^{\circ}\text{C}/\text{min}$  at  $50^{\circ}\text{C}$
- Sample area of  $40\text{mm} \times 40\text{mm}$
- 8 quick-release spring-clip connectors
- 2 x 4-pin Lemo feed-throughs
- 4 x Gold tipped Tungsten probes
- Gas tight chamber for atmospheric control
- Swing out lid for easy sample loading
- Can be used with transmitted or reflected light
- Mounts directly to microscope table or sub-stage
- 100 ohm platinum sensor
- Highly conductive metal for improved heat transfer
- Objective lens minimum working distance  $7.5\text{mm}$
- Condenser lens minimum working distance  $13.2\text{mm}$



The LTS120E-PL8 Peltier heated/cooled probe stage with temperature range of  $-40^{\circ}\text{C}$  to  $+120^{\circ}\text{C}$ , fitted with quick-release spring post connectors and LEMO feed-throughs.



Drawing showing major dimensions and vertical clearance required. When attached to a microscope the objective lens will require a working distance greater than  $7.5\text{mm}$

## LTS350E-P and LTS420E-P stage Systems

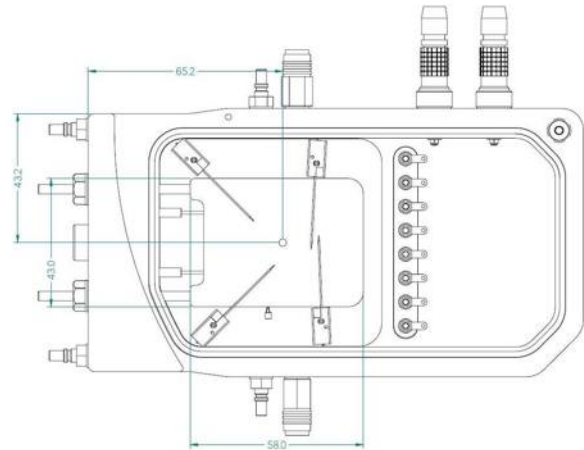
The LTS350E and LTS420E heating/freezing probe stages provide a wider temperature range for larger samples. They are supplied with the new T95-LinkPad system controller, and the optional LNP95 liquid nitrogen cooling system when fast cooling between +100C to -196C is required. As with all Linkam heating stages they can be fitted to most research grade microscopes and can be supplied with additional windows for UV/IR/x-ray work. The LTS series are ideal for small stand-alone experiments on the bench.

### Features and Benefits

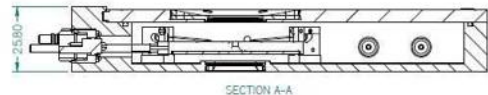
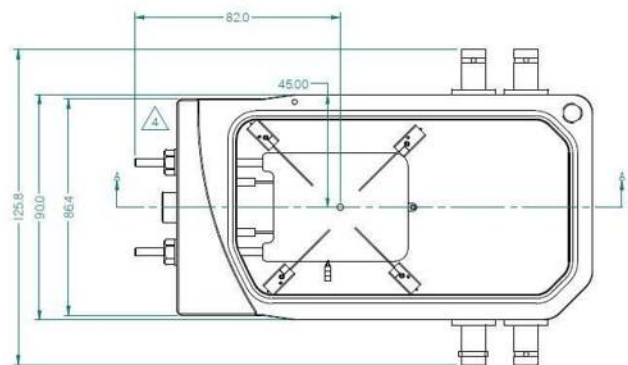
- Large sample format
- Wide temperature range (-196°C to +350°C or +420°C )
- Faster cooling (with LNP95)
- Up to 8 probes (LTS350E-PL8 and LTS420E-PL8)
- Lemo or BNC connectors (for handling smaller signal strength)
- Easy sample loading

### Specifications

- Temperature Range -196°C to 350°C or 420 °C
- Temperature stability <0.1°C
- Minimum Heating Rate 0.01°C/min
- Maximum heating rate of 30°C/min for LTS350E stages
- Maximum heating rate of 50°C/min for LTS420E stages
- Response time of <1 second at 5°C/min at 50°C
- Sample area of 53.5mm x 43mm
- 100 Ramp temperature profile programming
- Gas tight chamber for atmospheric control
- Can be used with transmitted or reflected light
- Objective lens minimum working distance: 8.55mm
- Condenser lens minimum working distance: 12.5mm



Layout of the LTS350E-PL8 (or LTS420E-PL8) showing the 8 quick-release spring connectors and the two Lemo feed-throughs.



Layout of the LTS350E-PB4 (or LTS420E-PB4) showing the 4 BNC connectors. When attached to a microscope, objective lenses with a working distance greater than 8.6mm will be required.

## HFS600E-PB4 stage Systems

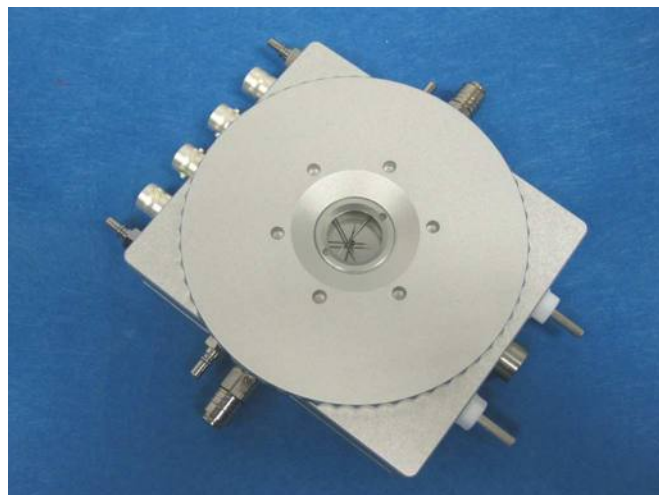
The HFS600E –PB4 heating/freezing probe stage provides the widest temperature range for smaller samples. It is supplied with the new T95-LinkPad system controller and the optional LNP95 liquid nitrogen cooling system when fast cooling between +100°C to –196°C is required. As with all Linkam heating stages it can be fitted to most research grade microscopes and can be supplied with additional windows for UV/IR/x-ray work.

### Features and Benefits

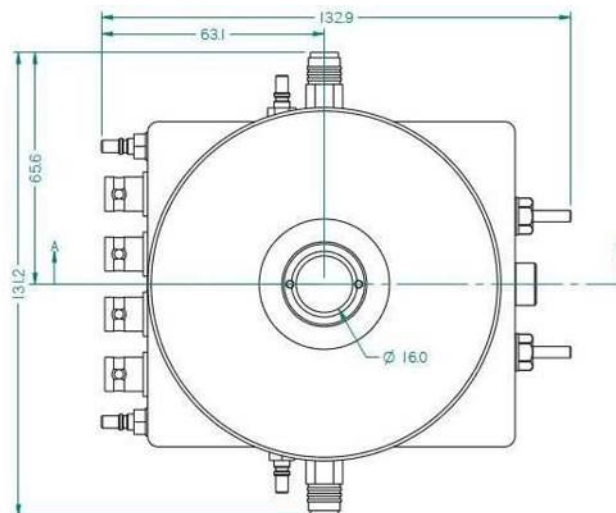
- Compact system
- Widest temperature range
- Fastest heating and cooling rates (with LNP95)
- Can be used vertically

### Specifications

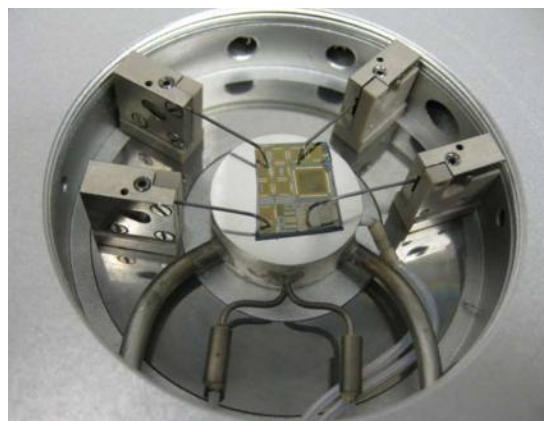
- Temperature Range -196°C (with LNP95) to 600°C
- Temperature stability <0.1°C
- Minimum Heating Rate 0.01°C/min
- Maximum heating rate of 150°C/min
- Maximum cooling rate 100°C/min
- Response time of <1 second at 5°C/min at 50°C
- Sample area of 22mm diameter
- 100 Ramp temperature profile programming
- Gas tight chamber for atmospheric control
- Can be used with transmitted or reflected light
- Objective lens minimum working distance: 4.7mm
- Condenser lens minimum working distance: 12.5mm



HFS600E-PB4 showing the 4 BNC feed-throughs, gas purge ports, liquid nitrogen cooling connectors, and water cooling inlets and outlets



HFS600E-PB4 - major dimensions (above) and detail showing the probes on a small circuit board (below)



## What do you need for a complete Temperature Control Solution?

### 1) Select Probe stage

DV2379 LTS120E-PL8 System (inc. PE95 LinkPad controller and ECP water circulator)

11054 LTS350E-PL8 stage

11077 LTS350E-PB4 stage

DV3085 LTS420E-PL8 stage

DV3086 LTS420E-PB4 stage

11074 HFS600E-PB4 stage

### 2) Select Controller

14067 T95-LinkPad — for stand-alone control

14068 T95-Linksys — for PC control

### 3) Select cooling option (for sample cooling down to -196°C)

14051 LTS-LNP95 — for LTS420E and LTS350E Systems (standard 39cm tubing incl. 2 litre Dewar)

### 4) Add Water circulator for body and window cooling when heating above 300°C

0998 ECP Water Circulator Pump (stage body and window cooling)(220-240V, 50Hz)

0997 ECP Water Circulator Pump (stage body and window cooling)(110-130V), 50Hz)

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 Stage Clamp to mount to microscope sub-stage

See website for full listing of [‘Stage Clamps’](#)

### 6) Add condenser extension lens for Köhler illumination at longer working distances

See website for full listing of [Condenser lenses](#)

### 7) Add software

15001 Linksys32 Temperature Control Software (supplied automatically with T95-Linksys controller)

15004 Linksys32 AV Temperature Control and Analogue Video Capture Software (inc video Card)

Compatible with all analogue cameras with composite or S-video outputs

15005 Linksys32 DV-NC Temperature Control and Digital Video Capture Software

Compatible with the range of Linkam tested cameras—see below

### 8) Add Camera

See website for full listing of [digital cameras](#)

### 9) Add Additional items

Spare probe assembly (9686), Vertical sample holder for HFS600E-PB4 (9767), special windows for UV/Vis/IR applications