

Systems for X-ray analysis

Small Angle x-ray scattering and powder diffractometry are established methods of sample analysis, and modern research frequently requires the combination of these methods with sample heating/freezing experiments. Linkam Scientific have adapted several of their standard instruments for use with x-ray techniques, such as the HFSX350 for heating / freezing and the TST250V for tensile studies.

Systems

HFSX350 stages

For general heating and freezing applications in the x-ray spectrometer the HFSX350 based systems have low space requirement, high temperature stability and are ideal for horizontal or vertical mounting. Two variants are available, the HFSX350-CAP supplied with a 1.7mm capillary tube passing through the heating block for liquid samples, and the HFSX350-GI with flush-mounted heating block for grazing incidence and surface mounted capillary.

TST250V for tensile experiments

This precision engineered instrument is designed for the accurate characterization of the tensile properties of materials in the range of 0 to 200N, with a maximum sensitivity of 0.001N. It incorporates unrivalled Linkam temperature control across the -50°C to $+250^{\circ}\text{C}$ range and is compatible with vacuum down to 10^{-3} mbar.

Temperature Control

Each system includes the advanced new standalone T95-LinkPad system controller with ergonomic LCD touch screen control and data sampling of 20 times per second. Heating rates have been increased, up to $150^{\circ}\text{C}/\text{min}$, for the HFSX350 stages. The controller has both USB and RS232 connectivity control by external software, and programmable outputs for synchronisation with external devices such as detectors and high speed cameras. See the T95 system technical datasheet for full details.

System Options

Cooling below ambient temperature

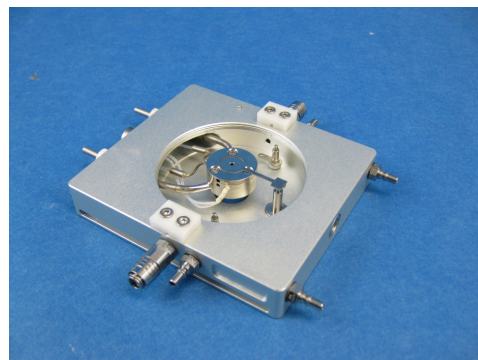
For cooling below ambient temperature the LNP95 cooling system designed by Linkam is a totally unique patented design utilising twin proprietary pumps. The precise control of liquid nitrogen flow enables specific stages to be controlled at linear cooling rates as fast as $100^{\circ}\text{C}/\text{min}$ or as slow as $0.01^{\circ}\text{C}/\text{min}$.

Heating above 300°C

When working at temperatures above 300°C for prolonged periods the ECP water circulator pump is used to keep the stage body cool.

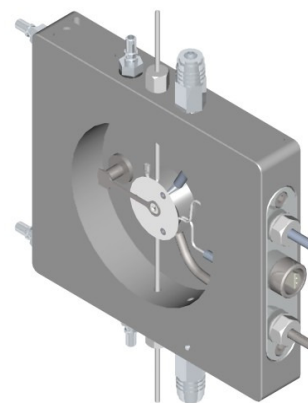
Cable/tubing sets

Extended control lead and liquid nitrogen tubing sets can be supplied with K or Conflat type vacuum flanges.



The HFSX350 heating and freezing stage

Temperature Range -196°C to 350°C



The HFSX350-CAP heating and freezing stage

Temperature Range -196°C to 350°C



TST250V Tensile System

Temperature Range -50°C to 250°C

HFSX350 Systems

The HFSX350 is a versatile design, suitable for conducting heating and cooling experiments on biological, metallic and polymeric materials in the SAXS diffractometer environment. Incorporating the Linkam proprietary heating block technology these stages are robust and reliable, with unrivalled temperature precision.

Features and Benefits

Suitable for vertical or horizontal mounting.

Compact, versatile design for easy mounting

Can be supplied for non-vacuum use with the standard THMS600 heating block giving a maximum 600°C

Connectors can be fitted for making in-situ electrical measurements on the sample

System Options

HFSX350-CAP

Capillary tube channel through the heating block for liquid samples

The stage can be supplied without lid, or with lid for tighter control of the sample environment (Kapton or Mica windows)

This instrument can also be used on an optical microscope

HFSX350-GI

Flush-mounted heating block for grazing incidence SAXS

Surface capillary tube mountings

Cooling below ambient temperature

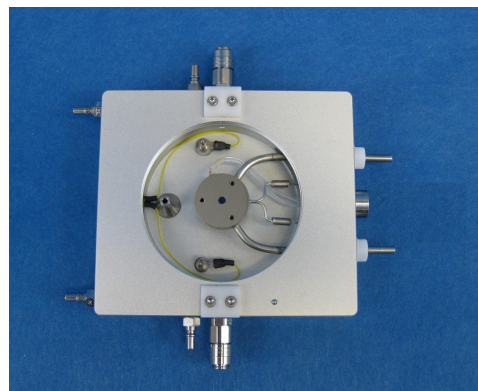
14057 THMS-LNP95-80 Automatic Control Cooling Pump with 2 litre Dewar and 80cm tubing achieving a minimum stage temperature of -100°C

14073 LNP95 - Automatic Control Cooling Pump system with 2 litre Dewar, including 79cm liquid nitrogen delivery syphon tubing (39cm outside chamber, 40 cm inside chamber) and 150cm LNP suction tube (90cm outside chamber, 60 cm inside chamber)

Specifications

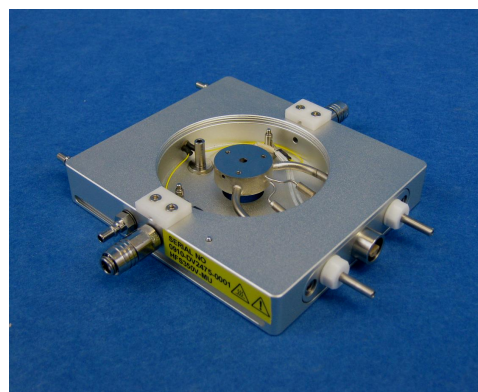
- Temperature range: -196°C^* to 350°C
- Heating Rate 30°C per minute
- Temperature stability $<0.1^{\circ}\text{C}$
- 100ohm platinum resistor sensor. 1/10th Din Class A to 0.1°C
- Vertical sample spring clip holder for solid samples
- Vacuum compliant heating block for use down to 10-3 mbar at maximum temperatures of 350°C

* Please note minimum temperatures will be higher with the longer tubing



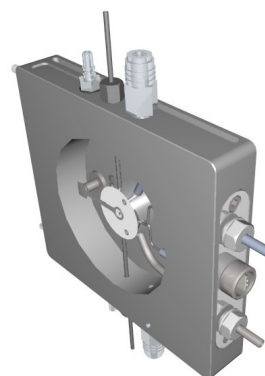
The HFSX350-GI heating and freezing stage

Temperature Range -196°C to 350°C



The HFSX350-GI heating and freezing stage

Showing the raised block for grazing incidence work



The HFSX350-CAP heating and freezing stage

Temperature Range -196°C to 350°C

Tensile Systems (TST250V)

The Linkam TST series of instruments is gaining increasing popularity with polymer, metallic and natural materials scientists, enabling them to characterize their materials on a micro-scale by applying loads up to 200N whilst making microscopic or x-ray observations during the deformation. The TST250V is built with two precision ground stainless steel lead screws to maintain perfect uniform vertical and horizontal alignment. Two load cell configurations are available, high range or high resolution, and these can be exchanged in-situ by the user.

Features and Benefits

Sample jaws move in opposite directions to maintain same field of view

Temperature control and accuracy is second to none, with a range from -196 °C to 250 °C with 0.01 °C control and up to 30 °C/min rates (Note: with longer cooling tubing the minimum will be -50 °C)

Vacuum compliant heating block for use down to 10⁻³ mbar at maximum temperatures of 250 °C

Test runs can be performed in seconds

Constant speed and constant force modes

Speed of jaws, force applied and distance moved can all be varied relative to the temperature

The sample chamber is sealed and can be controlled with various inert gases via the precision click fit valves built onto sides of the stage

System Options

0 to 20N with 0.001N resolution transducer

For high resolution work then include this transducer on your order

0 to 200N with 0.01N resolution transducer

For a wide range of materials then include this transducer on your order

Electrical connectors

Then select the TST250VE which is available with four internal electrical connections enabling you to make electrical measurements on the sample during a tensile experiment. The TST250VE can be operated with either of the 0 to 20N, or 0 to 200N transducers and with LNP95 cooling attachment.

Cooling below ambient temperature

If you require cooling in the range from ambient to -50 °C, the LNP95 cooling system is required.

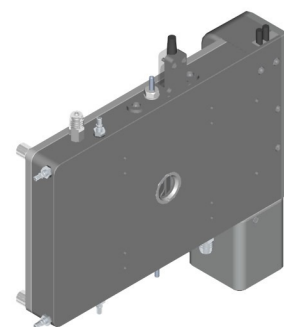
Specifications

- Sample width: 0.001 to 22mm
- Sample thickness: 0.001 to 2mm
- Minimum sample length: 26mm
- Maximum travel: 80mm
- Tensile speed range: 1-1000µm/s
- Tensile force range: 0.0N to 20N or 200N
- Force resolution: 0.001N or 0.01N
- Positional resolution: 10µm
- Temperature range: -50 °C to 250 °C
- Temperature control rates: 0.01 to 30 °C/min



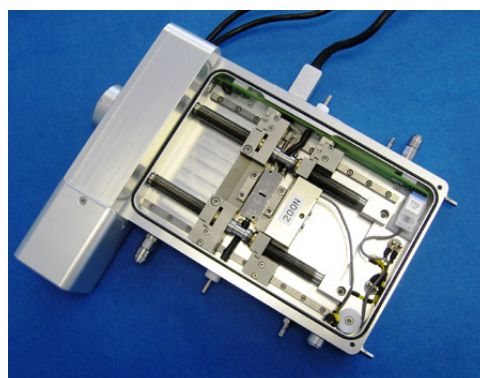
The TST250V tensile heating and freezing stage

Front view



The TST250V tensile heating and freezing stage

Rear view



The TST250V tensile heating and freezing stage

Lid removed

What do you need for a complete Solution

1) Select System

- 10800 HFSX350-CAP including T95 LinkPad system controller
- 10104 HFSX350-GI including T95 LinkPad system controller
- 22222 TST250V including T95 LinkPad system controller

2) Select heating block fixed aperture size

- For HFSX350-CAP and HFSX350-GI: 1.7 to 4.5mm
- For TST250V: From 1.5mm x 5mm to maximum 5 x 5mm (can be circular with max diameter 5mm)

3) Add System Control Software Linksys 32

- To enable PC control via RS232 (USB available in next revision)

15001 Linksys32 Temperature Control Software

4) Add Cooling Option

- 14073 LNP95 - Automatic Control Cooling Pump system.

Including 79cm liquid nitrogen delivery syphon (39cm outside chamber, 40 cm inside chamber), 150cm LNP suction tube (90cm outside chamber, 60 cm inside chamber), and vacuum flanges **

** Need to specify vacuum flange type on the order