

## DESCRIPTION

The **HCS402/HCS402XY** heating and cooling stage offers a temperature-controlled environment that is an ideal choice for optical thermal microscopy and other applications requiring optical access to the sample. Top and bottom dual pane windows in this stage are removable and exchangeable to meet a range of spectroscopic needs. The stage can be mounted vertically, allowing horizontal beam access to the sample chamber. Additionally, the HCS402/HCS402XY is large enough to accommodate a variety of samples, including electro-optic devices and standard 25mm x 75mm microscope slides. An inner thermal cover is also included for applications requiring ultra-high temperature stability and uniformity.



## KEY FEATURES

### Large Chamber

Suited to fit standard 25mm x 75mm microscope slides, liquid crystal cell holders, and electro-optical devices

### Sample Accessing

Quick sample access with spring-loaded pivoting top cover, and side-loading sample holder

### Rapid Heating Rates

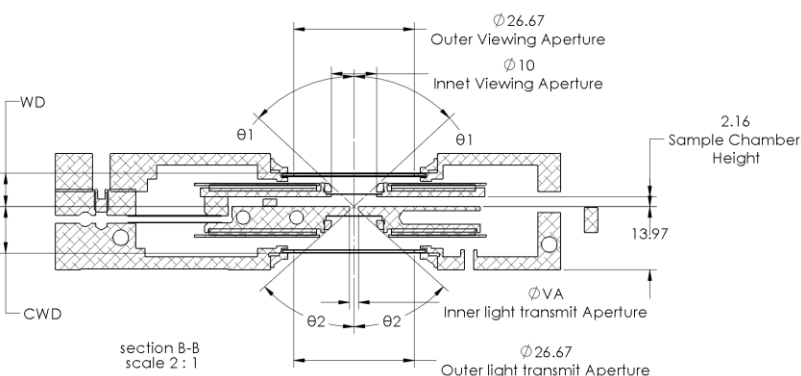
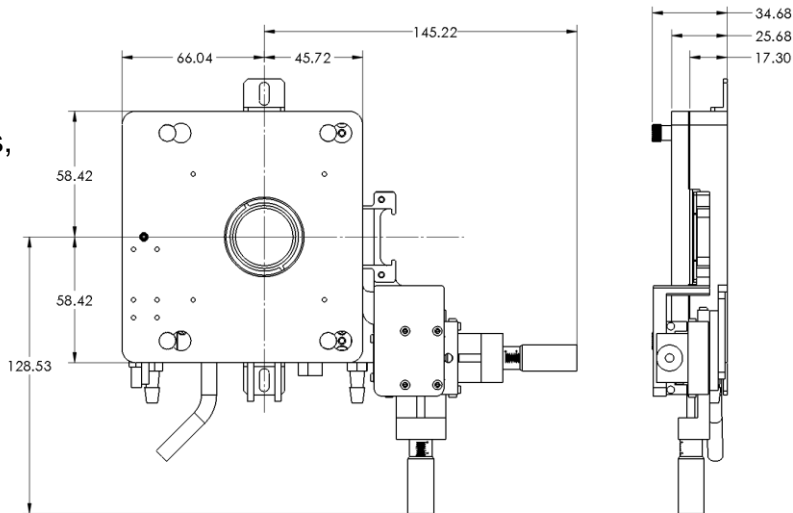
+100°C per minute max rate

### XY Positioning

Position sample at ease without having to remove the top cover with the optional XY positioner. With greater flexibility, sample area accessibility, and precision control, this option is optimal for use with a rotational stage on a polarizing microscope due to the directional nature of polarization

### Accuracy and Stability

A pt100 platinum RTD sensor is embedded into the sample heating and cooling block to guarantee high temperature accuracy and stability. The RTD sensor is calibrated to measure the temperature of the surface of the sample heating block – giving the closest and most accurate reading of sample possible. Additional sensor and alternative sensor, such as a thermistor, options are also available.



### Additional Features

- Includes standalone **mK2000** temperature controller
- Includes 'InstecApp' Windows compatible software for optional operation via PC
- Comes standard with optical glass windows that can be easily replaced with IR or UV transparent glass.

## Thermal Specifications

Temperature Control	<i>mK2000</i> with programmable precision switching PID method
Thermal Block	Clear anodized aluminum
Sample Thermal Cover	Optional removable Inner sample cover with additional window
Temperature Minimum	-60°C (with optional liquid N2 cooling; lower limit of -190°C available*)
Temperature Maximum	400°C
Temperature Sensor	100 Ω Platinum RTD
Maximum Heating Rate	+100°C per minute at 100°C
Maximum Cooling Rate	-40°C per minute at 100°C
Minimum Heating and Cooling Rate	±0.01°C per minute
Temperature Resolution	0.01°C
Temperature Stability	±0.05°C (>25°C), ±0.1°C (<25°C)
Power supply	Universal power input
Software	Windows software to record and export temperature-time data

## Optical Specifications

Optical access	Reflection and transmission capability
Optical windows	Removable and exchangeable windows permit full-spectrum transparency
Minimum Objective Working Distance	7.4 mm
Minimum Condenser Working Distance	10.3 mm
Top Window	Ø27 mm
Top Viewing Angle	±47° from normal
Transmission Aperture	Ø2 mm (5mm and 8mm options available)
Bottom Viewing Angle	±45° from normal
Window Defrost	Integrated external window defrost

## Structural Specifications

Sample Area	38 mm x 50 mm
Chamber Height	2.1 mm with removable inner cover Additional heights available with optional <i>spacers</i>
Sample Access	Side-loading holder and spring-loaded pivoting top cover
Sample Positioning	10mm fine travel with Vernier XY dials for remote manipulation
Frame Cooling	Integrated frame cooling with optional chiller system
Mounting	Horizontal and vertical mounting capability
Frame Dimensions	116.84mm x 111.76 mm x 25.7 mm
Weight	780 g

## Options

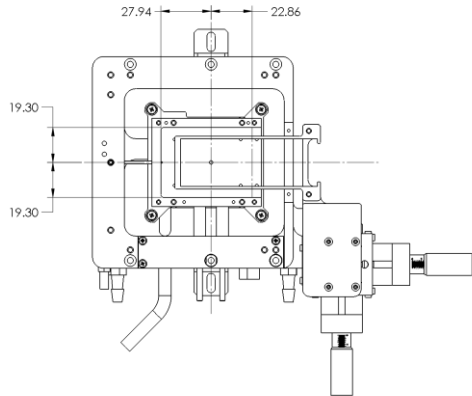
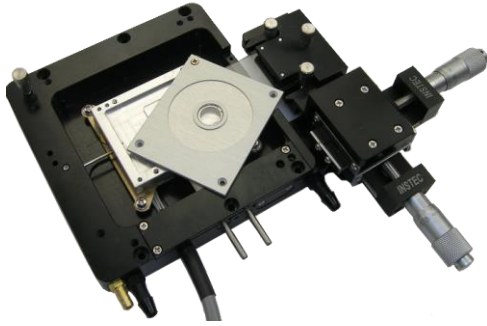
### Controlled Cooling

Extend lower temperature limit to -190°C with *LN2-P* cooling accessory; includes tubing and dewar (2L, 10L, or 30L). Enables active cooling with rates of up to -50°C per minute (at 100°C).

### Frame Cooling

Safety always comes first – keep the frame of the HCS402/HCS402XY cool and safe to touch with an optional water circulator. (see *C100W* chiller) Frame cooling option allows thermal control of frame independent of sample thermal block and aids in preventing frost buildup when cooling sample is being cooled below freezing temperatures.





## Spacer Set

Increase chamber height with fitted **spacer kit** to allow fitment of taller samples, while maintaining the gas tight capability with the top cover.

## XY Sample Positioning

Position sample while maintaining a sealed chamber with the optional XY positioner. With greater flexibility, sample area accessibility, and precision control, this option is optimal for use with a rotational stage on a polarizing microscope due to the directional nature of polarization

## Enlarge Aperture

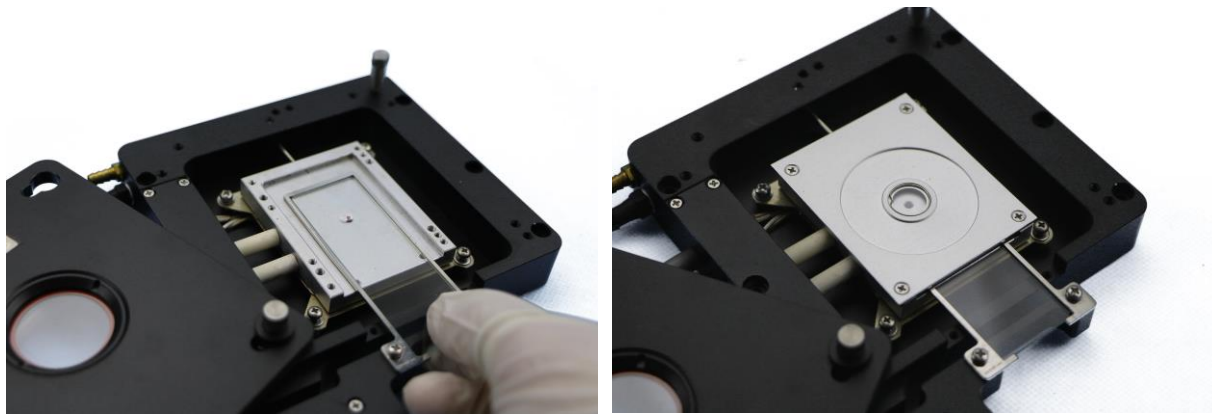
Standard Ø2mm viewing aperture can be increased to up to 8mm.

## Mounting Adapter

Various mounting adapters are available for most microscope models and/or instruments. Custom mounting adapter may also be made to fit each and every application.

## Inner Cover

The chamber height is the distance between the top surface of the thermal block and the bottom surface of the outer cover. With an optional inner cover, the distance is minimized in design to allow for just enough space for intended samples (slides, slipcovers, wafer pieces, etc.) and to decrease the minimum objective working distance. By closing the distance, the vertical temperature gradients are also significantly reduced.



## Microscope

Entry-level polarizing microscope offering superior performance for a variety of research applications with specifications to satisfy a wide range of demanding observational requirements. (see [TPM310-TR](#))

## Camera

Integrate digital image acquisition with sample temperature overlay. Includes software (WinDV thru InstecApp) USB 2.0 connection, 1.92-megapixel resolution, C-mount microscope connection standard. (see [MITO2](#))



## APPLICATIONS

With its versatility and wide selection of options and configurations, the HCP621G hot and cold plate is suitable for several different applications and experiments.

### Electrical

- Semiconductors
- MEMS devices
- PCBs

### Materials

- Metallurgy
- Crystallization
- Melting Point Analysis
- Oxidization
- Cloud Point Analysis

### Geology

- Fluid inclusion
- Thermal maturation

### Oil and Gas

- Characterization
- Flow Studies

### Polymers

- Temperature testing
- Formulation

### Space Science

- Solar panel component testing
- Material testing under vacuum

