

### DESCRIPTION

The **TS102/TS102XY** Thermoelectric (TEC) stage is designed for applications where long duration experiments without liquid nitrogen are critical. Using a thermoelectric heater, this stage provides cooling to  $-40^{\circ}\text{C}$  without the use of liquid nitrogen, ultimately simplifying the system setup and reducing operating costs. The TS102/TS102XY stage is a perfect choice for researchers needing both heating and cooling over a moderate temperature range.



### KEY FEATURES

#### Sample Side Loading

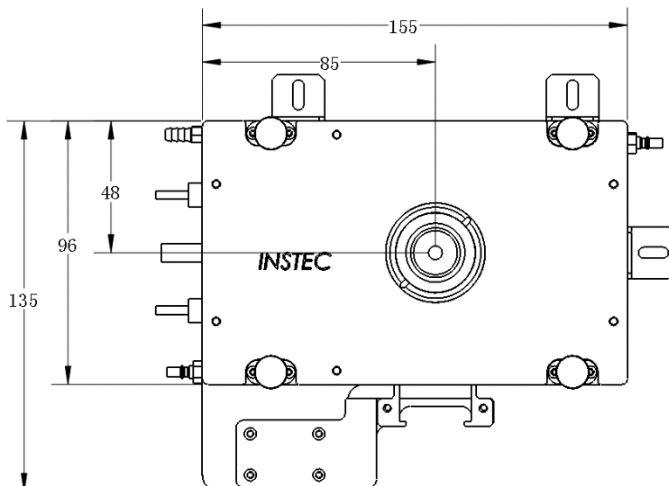
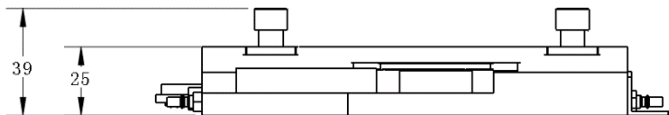
Convenient side loading of samples, accommodates standard 25mm x 75mm microscope slides as well as Instec liquid crystal cell holders. Simplifies experiments and saves time without having a need to remove and replace the thermal stage cover.

#### Thermoelectric Heating and Cooling

TEC heating and cooling provides exceptional temperature stability and range without the need for consumable coolant. Heat up to  $120^{\circ}\text{C}$  and cool down to  $-30^{\circ}\text{C}$  with our standard C100W benchtop water circulator, or  $-40^{\circ}\text{C}$  with an upgraded [CW5000 Chiller](#).

#### Accuracy and Stability

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



#### 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 bidirectional LVDC output
Thermal Block	Clear anodized aluminum
Sample Thermal Cover	Optional removable inner sample cover with additional window
Temperature Minimum	-30°C with standard water circulator -40°C with optional upgraded chiller
Temperature Maximum	120°C
Temperature Sensor	100 Ω Platinum RTD
Maximum Heating Rate	+30°C per minute at 37°C
Maximum Cooling Rate	-15°C per minute at 37°C
Minimum Heating and Cooling Rate	±0.01°C per minute
Temperature Resolution	0.01°C
Temperature Stability	±0.05°C
Power supply	Universal power input – 150W max (Not including water-cooling accessories)
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	5.8mm
Minimum Condenser Working Distance	16.5mm
Top Window Aperture	Ø27mm aperture (Ø31.75mm x 1mm glass)
Top Viewing Angle	±60° from normal
*Optional Inner Lid Aperture	Ø16mm aperture (Ø18mm x Ø0.2mm glass)
Transmission Aperture	Ø5mm (optional upgrade to Ø6mm, Ø8mm, and Ø10mm available)
Bottom Window Aperture	Ø11mm aperture (13mm x 0.2mm glass)
Bottom Viewing Angle	±18° from normal
Window Defrost	External top window defroster, Integrated inner window defroster

## STRUCTURAL SPECIFICATIONS

Sample Area	40mm x 40mm
Chamber Height	2.5 mm with removable inner cover, 4mm without 1.5mm and 3.0mm height spacer options available
Sample Positioning	Standard 75mm x 25mm static glass slider holder Optional upgrade to TS102XY add 10mm fine travel with vernier dials for XY sample manipulation. Compatible with XY slide holder and Instec liquid crystal holders (LCH requires 3mm spacer kit)
Frame Cooling	Integrated TEC cooling with included C100W water-cooler. An optional chiller upgrade is available to increase the temperature range
Mounting	Base model includes tapped holes on frame and removable side-mounted L-brackets. Horizontal mounting adaptors for specific instruments are available by request
Frame Dimensions	155mm x 135mm x 25mm
Weight	800g

## OPTIONS



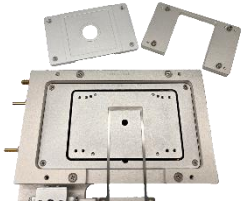
### Upgraded Chiller

Achieve lower minimum temperature with an upgraded water-cooler. The CW5000 has an internal refrigeration unit which cools down to 5°C, lowering the minimum temperature reachable by TEC systems. Chiller upgrade also requires FVC11 valve box for flow control.



### Liquid Crystal Cell Holder

With the featured sample side-loading, easily experiment with LC cells in combination with our Liquid Crystal Cell holders without having to remove the thermal stage lid. Also requires lid spacers depending on LC cell holder model.



### Spacer Set

Increase the chamber height to accommodate larger samples, or an Instec LC cell holder.



### 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.). 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 [TPM-CX40](#))



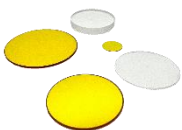
### Microscope Camera with Temperature Overlay

Integrate digital image acquisition with sample temperature overlay. Includes software (WinDV2 via InstecApp), USB 3.0 connection, 20-megapixel resolution, and standard C-mount microscope connection. (see [MITO2](#))



### Mounting Adapter



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



### Windows

Additional or alternate available windows are Sapphire, BaF<sub>2</sub>, CaF<sub>2</sub>, ZnSe (see [HCS601GXY-IRM](#) for IR applications).

## SIMILAR PRODUCTS

	HCS302/HCS302XY	HCS402/HCS402XY	TS102VXY	TS102Si
				
Temperature Range	-190°C to 400°C	-190°C to 400°C	-40°C to 120°C	-30°C to 120°C
Atmospheric Control			✓	
Sample Area	38mm x 50mm	38mm x 50mm	40mm x 40mm	Ø35mm/ 24mm x 75mm
Sample Cooling	LN2	LN2	TEC	TEC
Thermal Block	Aluminum	Aluminum	Aluminum	Aluminum
Option to Increase Chamber Height	✓	✓		
Side Loading	✓	✓		

## Other products to consider....



**HCS621GXY** heating and cooling stage with 28mm x 28mm sample area. Temperature range -190°C to 600°C. Gas-tight chamber with gas purge capabilities. Includes XY positioning and option to add electrical feedthroughs. Offers increased temperature range versus TS102, and also supports atmospheric control. Unlike TS102, requires LN2 for sample cooling.



**HCS601G-IRM** FTIR heating and cooling stage with 24mm x 24mm sample area. Temperature Range -190°C to 600°C. Gas-tight chamber with gas purge capabilities. CWD=10.5mm WD=10.5mm, cone angle>100°C. Includes IR windows. Optimized for IR applications, and offers larger temperature range, but requires LN2. Does not support sample XY positioning.



**HCP600G-CAP** heating and cooling plate for capillary tube applications. 28mm x 30mm sample area. Temperature range -190°C to 600°C. Gas-tight chamber with gas purge capabilities. Manipulate capillary tube while maintaining chamber atmosphere. Optimized for Capillary tube samples, but does not support transmission-based instruments. Requires LN2 for sample cooling.

CONTACT A REPRESENTATIVE 