

# OptiCool Sample Positioner and Mounting Options

## X130 - Integrated Nanopositioners (Includes X132 Thermal Link)

The OptiCool cryostat can be configured with a piezo-based nanopositioning stack to move your sample in-situ over the full range of temperature and magnetic field. The X130 Integrated Nanopositioner option with position-feedback provides full X, Y, and Z motion control and knowledge of your sample position.

The nanopositioner stack, comprised of two attocube ANPx311 stages and one ANPz102 stage, provides a travel range of 5.8 mm in the X and Y directions and 4.8 mm in the Z direction for focusing. The resistive position-feedback has a resolution of 200 nm and a repeatability of 1 to 2  $\mu\text{m}$ . This allows you to consistently go back and find features of interest on your sample. The stages can also be run in fine positioning mode with a range of 0.8  $\mu\text{m}$  (X and Y) at 4K with sub-nm resolution. The X130 includes spacers to vary the vertical stack location by 14 mm to accommodate a variety of experiment needs.

## X132 - Thermal Link

Quantum Design has created a custom Thermal Link for use with Integrated Nanopositioners. The Thermal Link effectively cools your sample while providing full mobility for linear positioner motion in X, Y, and Z. The high-A/L design is optimized for cooling at high magnetic fields where magnetoresistance reduces the effectiveness of other high-RRR thermal links. The Thermal Link comes with a built-in thermometer to give you an accurate temperature reading close to your sample without impacting clearance. The X132 Thermal Link is included with the X130 Integrated Nanopositioners or it can be purchased separately for use with other positioner stacks.

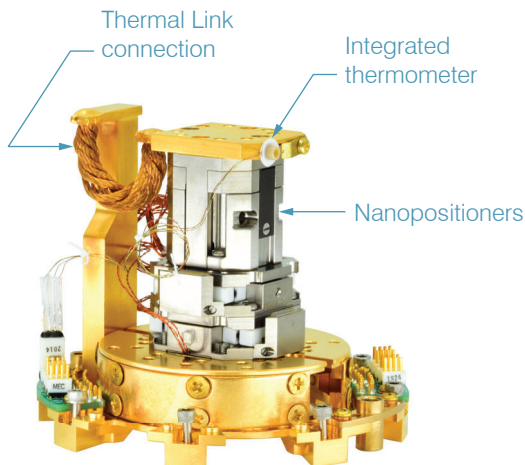


Image shows the X130 Integrated Nanopositioners with the X132 Thermal Link option and integrated thermometer.

## X140 - Rapid Thermal Stage

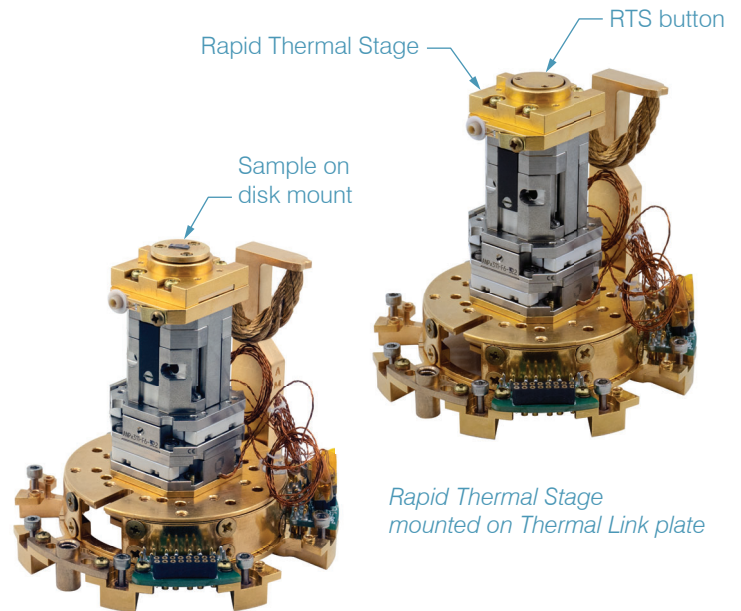
Many experiments in OptiCool require x-y positioning of the sample to locate a region of interest, and z positioning to focus a microscope objective lens on the sample. To reduce the effect of thermal drift on focus, the X140 Rapid Thermal Stage (RTS) controls the temperature of a small button where the sample is mounted, while maintaining the rest of the components at low temperature. This results in focus shift of  $< 30 \mu\text{m}$  over the temperature range 1.8 to 350 K.

In addition to helping you maintain focus, the RTS changes temperature very quickly due to its small size. Temperature changes that would normally take hours are accomplished in  $< 30$  minutes.

The Rapid Thermal Stage includes an integrated thermometer and heater located directly under the sample button for accurate temperature measurement and control (you can read this temperature through MultiVu).

Samples can be mounted directly to the Rapid Thermal Stage button, or to one of the easy-to-install Disk Mounts included with option.

The Rapid Thermal Stage is designed to be cooled by the Quantum Design X132 Thermal Link. The RTS may be compatible with other thermal links (although each case would need to be determined individually).



\* Specifications when mounted to Quantum Design X132 Thermal Link:

• Temperature range:	1.8 K to 350 K
• Focus shift over temperature range:	$< 30 \mu\text{m}$ (sample mounted directly to button) $< 35 \mu\text{m}$ (sample mounted to 1.4 mm thick disk mount)
• Temperature sweep times (disk mount installed):	2 K to 300 K: $< 6$ minutes 300 K to 2 K: $< 30$ minutes

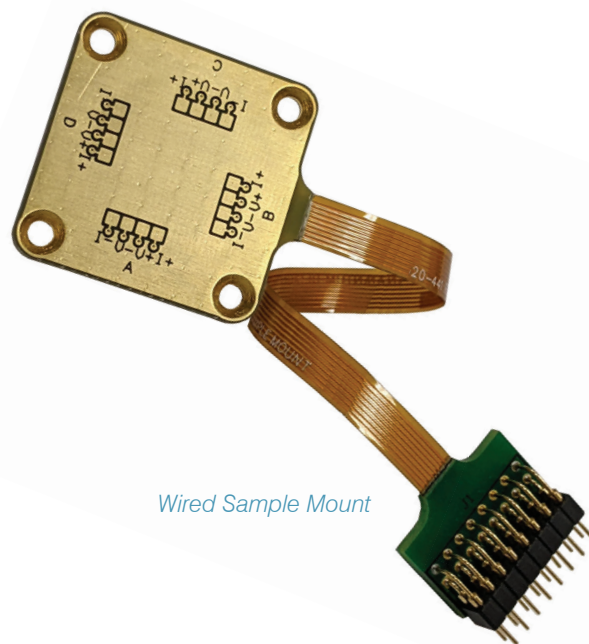
## X150 - Wired Sample Mount Kit

Optical measurements often require electrical contact (for gating and transport measurements) while focusing a microscope objective on the sample.

The Wired Sample Mount provides a gold-plated copper plane that is thermally connected to the X132 Thermal Link plate and provides 16 pre-wired pads for connecting electrical leads to your sample. Unlike standard chip carriers, the mount's copper plane makes metallic contact through solid copper to the Thermal Link plate – this will typically cool mounted samples to within < 50 mK of the Thermal Link temperature.

An integrated flexible circuit carries the 16 wires to the pod flange. The Wired Sample Mount is designed to be used with OptiCool's Standard Sample Wiring (X300).

The Wired Sample Mount Kit includes 4 Wired Sample Mounts, the mating PC board that goes on the Pod flange, and the associated mounting screws.



Wired Sample Mount

## OptiCool Wiring and Feedthrough Options

Wiring and feedthrough options are available to get electrical and optical signals into and out of the OptiCool cryostat. Pick from these options to meet your experimental needs. Each is described in more detail on the following pages.

- **X300 Standard Sample Wiring.** 16 wires (8 twisted pairs) for user signals.
- **X301 3-Axis Positioner Wiring.** Used to drive piezo positioners.
- **X310 RF Coax Wiring.** Four coax lines for signals up to 20 GHz.
- **X280 Optical Fiber Feedthrough.** Feed four or more optical fibers into the sample volume. Can also be used for other items such as gas tubes.

The wiring options are permanently mounted in the cryostat, so are usually installed at the factory. The fiber feedthrough is easily installed or removed by the end user.

To use the wiring, simply wire from the pod connectors to your hardware. When the pod is inserted into OptiCool, connections are automatically made to the cryostat wiring (fiber connections must be made manually). The signals then run from your experiment to the OptiCool front panel. All the wiring is thermally anchored inside the cryostat, ensuring the wires will not disrupt your sample's temperature.

Please contact Quantum Design to discuss the best wiring combination for your needs.

* Specifications:	
• Compatible with full OptiCool temperature and magnetic field range	
• Mounts to X132 Thermal Link Plate and compatible with X140 Rapid Thermal Stage	
• Electrical connections:	16 connections (8 pairs) Pads for wire bonding or soldering Pads arrange in 4 four-probe sets Automatic connections from pads to OptiCool front panel (no manual wiring)

Wired Sample Mount attached to Thermal Link plate

