

CoolerHeater Accessory for the MFP-3D™ AFM

The CoolerHeater accessory uses a Peltier element to heat and cool small samples within the range of -35°C to +120°C, ideal for a wide range of thermally-controlled experiments.

CoolerHeater Stage

The CoolerHeater stage, based on our Closed Fluid Cell design, seals out the ambient environment with an FKM (Viton® equivalent) rubber membrane and O-rings. Four O-ring sealed access ports allow for dry or inert gas purge, injection of fluids, or electrical access. Samples can be mounted on standard AFM sample discs and magnetically held to the temperature controlled metal surface. Metal clips can also be used to hold down samples. The temperature controlled surface is 15 x 15mm but can hold slightly larger samples. The temperature sensor is embedded in the sample stage and slight offsets to the actual sample surface temperature are to be expected. This surface is sealed into the heater assembly so liquid drop experiments can be performed without worry of damage or electrical short circuits. A top illuminated, top view (only) of the sample is possible with the appropriately outfitted MFP-3D AFM.



The CoolerHeater accessory includes the Environmental Controller, the coolant pump, and the sample holder stage.



CoolerHeater stage with magnetically mounted 12mm mica disk.

Fluid Cell

The fluid cell is constructed of durable materials such as anodized aluminum, PEEK™, and tungsten. All parts can be cleaned and partially disassembled, although autoclaving or complete immersion is not recommended. For liquid drop experiments, a small drop can be placed on a thin piece of mica or glass epoxied to a magnetic AFM disc. The drop will then be in contact with the mica/glass and the AFM cantilever holder, which is constructed of PEEK, quartz, and stainless steel.

Coolant Pump

A coolant pump is required for measurements below ~0°C when the Peltier generates sufficient heat. A trickle of cooling fluid prevents the stage from overheating. Room temperature coolant is supplied to a closed cooling liquid circuit that includes a computer controlled pump and two reservoirs (pictured left). To achieve the lowest possible temperatures (i.e. -35°C), the coolant reservoirs can be detached from the pump base and immersed in chilled water. Safety sensors prevent the heating stage from overheating in case of an insufficient cooling water supply. The coolant pump is a SmartStart™ device that autoconfigures upon plug-in. The coolant flow rate is software controlled.

Environmental Controller – Closed Loop Accuracy

The CoolerHeater requires the Environmental Controller (purchased separately). The built-in microprocessor maintains closed loop performance independent of the AFM controller. All control and measurement functions are fully programmable through the software interface, including built-in capability for temperature ramps. Fully integrated temperature information is stored with each AFM image. SmartStart allows plug and play operation without the use of parameter files.

Specifications

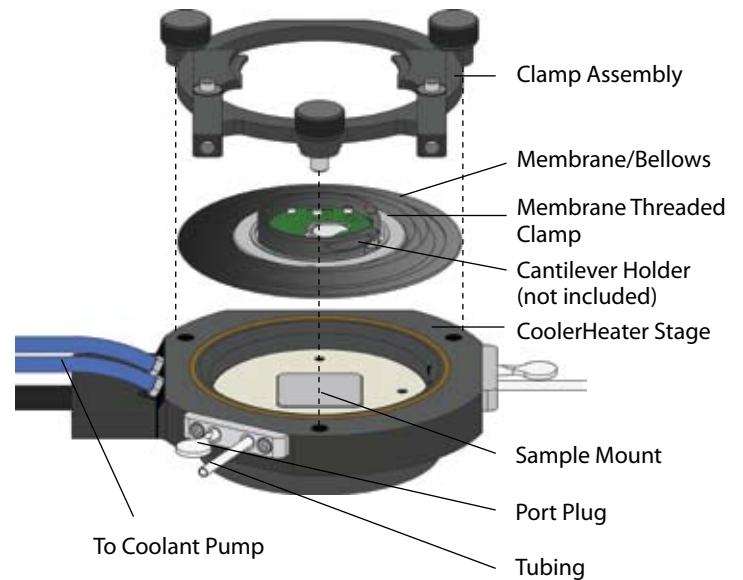
CoolerHeater Model CLRHTR

The CoolerHeater includes the CoolerHeater Stage, a Cooling Pump, and Accessory Kit. Requires the Environmental Controller (purchased separately):

- CoolerHeater Stage assembly 1
- Cooling Pump assembly 1
- Clamp assembly 1
- 12mm AFM sample disk 1
- 12mm cover slip 10
- FKM membrane/bellows 4
- Membrane threaded clamp 1
- 1/16" PFA Tubing 5'
- 3C tweezer, extra fine sharp 1
- Leitsilber conductive paint 1
- A variety of O-rings
- A variety of assembly and cleaning tools

Temperature control

- 0°C to +120°C without cooling pump
- -25°C to +120°C with cooling pump and room temperature coolant
- Minimum temperature -35°C with chilled coolant
- 0.1°C precision, accuracy and maximum overshoot



Schematic of the CoolerHeater assembly.

Gas flow through

Maximum pressure 2.5psi

Sample size

- 15mm diameter
- 2mm thickness (for completely sealed operation)

Liquid fluid volume-droplet

Four 1/16" diameter input ports

Cleaning

- Easy and complete disassembly
- Not autoclavable

Materials

- Stage: PEEK, anodized aluminum
- Membrane: FKM

Environmental Controller Model ENVIRO

- Closed loop operation
- SmartStart for plug and play operation
- Operates at 110 or 220 VAC
- CE tested
- Built-in microprocessor for temperature control
- Fully programmable through the MFP-3D software