



Lightning Arctic

In Situ TEM Cooling, Biasing and Heating Solution

The **Lightning Arctic** In Situ Cooling, Biasing and Heating Solution is a new addition to the DENSsolutions product family. The **Lightning Arctic** system allows for observing the real-time dynamics of your specimen at atomic resolution under a controllable electrical stimulus, either during cooling with liquid nitrogen temperatures or during heating.

Specification	TF	JEOL
Polepiece compatibility	Twin, S-twin, X-twin	UHR, FHP, HRP, WGP
EDS compatibility	Side entry, Super-X, Dual-X	Side entry
EELS compatibility	Yes	Yes
Number of electrical contacts	6	9
Sample carrier compatibility	MEMS-based Nano-Chips, 3 mm TEM grids	
MEMS Nano-Chips compatibility	Heating, Heating & Biasing	
Alpha tilt range* (w/o LN ₂ dewar)	S-twin $\geq \pm 22$ deg X-twin $\geq \pm 17$ deg	UHR/FHP $\geq \pm 8$ deg HRP $\geq \pm 15$ deg
Beta tilt range*	S-twin $\leq \pm 20$ deg X-twin $\leq \pm 20$ deg	UHR/FHP $\leq \pm 10$ deg HRP, WGP $\leq \pm 15$ deg
System operation modes	Heating and/or Biasing [†] , Cooling and/or Biasing [†]	
Operation temperature range **	≤ -160 °C – 800 °C	
Temperature range in heating mode **	RT– 800 °C	
Temperature range on cooling	≤ -160 °C to 100 °C	
Temperature accuracy (absolute)	$\geq 95\%$ (T°C)	
Temperature control mode	Closed 4-point probe feedback loop	
Continuous temperature control	Yes, set any intermediate temperature	
Cooling agent	Liquid Nitrogen	
Liquid nitrogen dewar	External	
Cooling & Stabilization time	~ 60 min	
Sample Heating/Cooling rates	100 °C/s	
Operational time (without a refill)	At least 4 hr	
Attainable Resolution (TEM/STEM)***	≤ 1.5 Å (≤ 2.0 Å)	
Sample Drift ***	≤ 2 nm/min	
Voltage operation range (-160 °C – 800 °C)	$\geq \pm 40$ V	
Detectable current range	pA to mA	

* Tilt ranges are dependent on the exact pole piece gap, microscope configuration and EDX detector used and might vary from the listed specifications.

** The maximum heating temperature can be extended when using a dedicated heating Nano-Chip.

*** Listed specifications are dependent on microscope specifications and its performance. For microscopes operated from the same room (e.g. not remotely), the resolution specification is equal or below 2 Å.