

## Technical Specifications

General Specifications	
type of instrument	cantilever based AFM with interferometric deflection detection
sensor head specifics	attoAFM I+ head feat. alignment-free cantilever holder, tip exchange in less than 2 minutes
alignment-free cantilever holder (default)	compatible with PointProbe® Plus XY-Alignment Series by Nanosensors
conventional cantilever holder (optional)	compatible with standard commercial cantilevers
Modes of Operation	
imaging modes	contact mode, non-contact mode, constant height, constant force
slope compensation	2 axis scan plane correction
z feedback	PI feedback loop for amplitude modulation (AM), phase modulation (PM) or frequency modulation (FM) using included PLL, constant force AFM
incl. standard techniques	AFM
optional upgrades	MFM, KPFM, PFM, conductive-tip AFM
Resolution	
measured RMS z-noise (constant force @ 4 K, 5 ms pixel time)	< 0.10 nm (expected for attoDRY), < 0.15 nm (guaranteed)
z deflection noise density	< 3 pm/vHz (dependent on laser system)
lateral magnetic resolution	< 50 nm (attoDRY)
z bit resolution @ 4 K	57 pm at 15 µm scan range
Sample Positioning	
total travel range	5 x 5 x 4.8 mm <sup>3</sup> (open loop)
step size	0.05..3 µm @ 300 K, 10..500 nm @ 4 K
fine scan range	50 x 50 x 24 µm <sup>3</sup> @ 300 K, 30 x 30 x 15 µm <sup>3</sup> @ 4 K (open loop)
closed loop scanning	optional
sample holder	ASH/QE/4CX quick-exchange sample holder with 8 electrical contacts, integrated heater with calibrated temperature sensor
Suitable Operating Conditions	
temperature range	1.5 K..300 K (dependent on cryostat); mK compatible setup available on request
magnetic field range	0..15 T+ (dependent on magnet)
operating pressure	designed for He exchange gas (vacuum compatible version down to 1E-6 mbar on request)
Suitable Cooling Systems	
titanium housing diameter	48 mm
bore size requirement	designed for a 2" (50.8 mm) cryostat/magnet bore
compatible cryostats	attoDRY1000/1100/2100
Compatibility with Electronics	
scan controller and software	ASC500 (for detailed specifications please see attoCONTROL section)
laser	LDM1300 laser/detector module (for detailed specifications please see attoCONTROL section)
Options and Upgrades	
closed loop scanning & global sample coordinates	interferometric encoders for scan linearization and closed loop sample navigation
ultra-large scan range upgrade	80 x 80 µm <sup>2</sup> @ 300 K, 125 x 125 µm <sup>2</sup> @ 4 K
in-situ inspection optics	tip/sample monitoring via in-situ LT-LED for illumination, mirrors, lenses and CCD camera (outside), field of view approx. 3 x 2 mm, resolution approx. 20 µm (depending on cryostat)
closed loop upgrade for coarse positioners	resistive encoder, range 5 mm, sensor resolution approx. 200 nm, repeatability 1-2 µm
additional AFM head with manual alignment	conventional cantilever holder, compatible with standard commercial cantilevers

