**Technical Specifications**

**General Specifications**
- **type of instrument**: tuning-fork based AFM with shear-force or standard detection
- **sensor head specifics**: etched metal wires, etched or pulled optical fiber probes, STM tips, Akiyama probes (also compatible with NaugaNeedles commercial tips)

**Modes of Operation**
- **imaging modes**: non-contact mode AFM, EFM, SGM
- **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
- **optional upgrades**: AFM/STM mode

**Resolution**
- **measured z-noise density**: < 16 pm/√Hz
- **z bit resolution @ 4 K**: 7.6 pm at 2 µm scan range

**Sample Positioning**
- **total travel range**: 5 x 5 x 5 mm³ (open loop)
- **step size**: 0.05..3 µm @ 300 K, 10..500 nm @ 4 K
- **fine scan range**: 50 x 50 x 4.2 µm³ @ 300 K, 30 x 30 x 2 µm³ @ 4 K (open loop)
- **sample holder**: ASH/QE/0 quick exchange sample holder and 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, attoLIQUID1000/2000/3000/5000

**Compatibility with Electronics**
- **scan controller and software**: ASC500 (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 µm² @ 300 K, 125 x 125 µm² @ 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
- **sample holder upgrade**: ASH/QE/4CX quick-exchange sample holder (8 electrical contacts, integrated heater & T-sensor)