

## Technical Specifications

<b>General Specifications</b>	
type of instrument	free-beam based external optics head coupled to low temperature objective and ultra-high transmission spectrometer
sensor head specifics	unique low temperature compatible achromatic objectives with high numerical aperture, optimized for different wavelength ranges
<b>Confocal Unit</b>	
configuration	compact and modular design, two or more optical channels; standard configuration: one excitation and one detection channel
key benefits	quick and reliable alignment of each channel, steering mirror for combined beams long-term stability
quick-exchange of optical components	beam splitters, filter mounts for up to 4 filters/polarizers, (1" diameter); optional piezoelectric rotator with filter mount
pinhole configuration	two pinholes (fiber apertures), different illumination and collection wavelength possible
pinhole size	dependent on fibers, typically 3 .. 9 $\mu\text{m}$ mode field diameter
compatible LT-objective	LT-APO/VIS, LT-APO/VISIR, LT-APO/NIR (see accessory section for more information)
inspection unit	sample imaging with large field of view: $\sim 54 \mu\text{m}$ (attoDRY), $\sim 40 \mu\text{m}$ (attoLIQUID)
<b>Illumination</b>	
excitation wavelength range	400 .. 1000 nm, default 532 nm (others on request)
illumination port specification	FC/ APC-connector for single mode fibers or free-beam configuration
light source	dedicated Raman laser, single mode fiber coupled
light power on the sample	typically 1 pW..10mW
optical filter	laser line filter
<b>Detection</b>	
detection mode	2D Raman images, time and single point Raman spectra
spectrometer	ultra-high transmission spectrometer, $f=300 \text{ mm}$
total optical transmission	greater 60% at 532 nm
filters	dichroic mirror & edge filter for signal detection as close as 90 $\text{cm}^{-1}$ to the laser line
gratings	typ. 600/mm and 1800/mm grating
spectral resolution	1 $\text{cm}^{-1}$ at 1800/mm grating
CCD camera	back-illuminated CCD, peltier-cooled to $-60 \text{ }^\circ\text{C}$ at $20 \text{ }^\circ\text{C}$ room temperature, 1024x127 pixels, 90% quantum efficiency at 532 nm, 100 kHz readout converter
<b>Sample Positioning</b>	
total travel range	5 x 5 x 4.8 $\text{mm}^3$ (open loop)
step size	0.05..3 $\mu\text{m}$ @ 300 K, 10..500 nm @ 4 K
fine scan range	50 x 50 $\mu\text{m}^2$ @ 300 K, 30 x 30 $\mu\text{m}^2$ @ 4 K (open loop)
sample holder	ASH/QE/0 quick exchange sample holder and integrated heater with calibrated temperature sensor
<b>Suitable Operating Conditions</b>	
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)
<b>Suitable Cooling Systems</b>	
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 (attoLIQUID3000/5000 on request)
<b>Compatibility with Electronics</b>	
scan controller and software	FPGA-based RAMAN controller providing coarse positioning and scanning signals for x, y, and z.
<b>Options and Upgrades</b>	
in-situ inspection optics	incl. with CFM I external optics head
closed loop upgrade for coarse positioners	resistive encoder, range 5 mm, sensor resolution approx. 200 nm, repeatability 1-2 $\mu\text{m}$
sample holder upgrade	ASH/QE/4CX quick-exchange sample holder (8 electrical contacts, integrated heater & T-sensor)
Voigt geometry upgrade	optional scanner for Voigt & Faraday geometry

