attocube
WITTENSTEIN group

attoDRY

making low temperature easy

CRYOGENIC INSTRUMENTS

cool tools for cold science

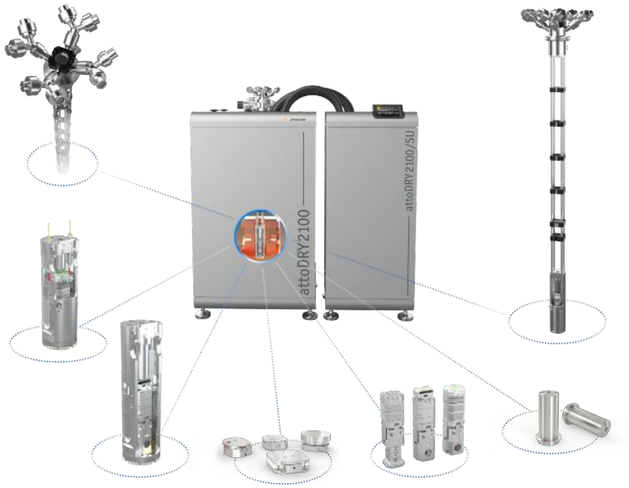
Adapt your Experiment with full Flexibility

find the perfect setup for your experiment

Whether you're conducting high-resolution confocal microscopy or building a fully customized setup, our systems give you the freedom to innovate without limitations.

Quick & Easy Exchange - the Optical Breadboard Ad-On

The optical breadboard add-on extends the free-beam optical path onto the cryostat, mounts directly to all attoDRY toploaders, and features a slider system that enables fast swapping between optical setups.



A Home-Builder Platform - the CFM Base Kits

From cage plate versions for maximum flexibility, to trueNAV for ultimate positioning precision, we offer microscopy base kits tailored to your needs.

- cage plate version: maximum flexibility for experienced home-builders.
- easy housing version: simplified integration of the positioner/ scanner stack, easy sample mounting, ready for upgrades, optimized for vibration stability.
- rotation version: including a rotating base, full 3D field with 2D vector magnets.
- trueNAV version: highest positioning precision in any attocube insert yet.

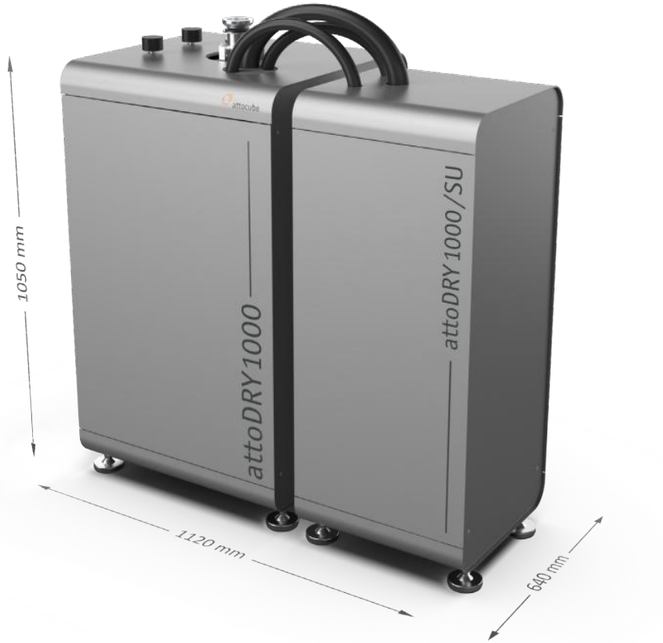
Customer Feedback: Prof. M. Atatüre, University of Cambridge, UK

"The delivery of the attoDRY1000 was well within the anticipated time frame, the installation was carried out successfully and since then, the system has given full satisfaction. All quoted specifications were fulfilled or exceeded, and the service, maintenance and support have proven to be excellent. The unit has been operational since the first day and continues to function with no interruptions. I can verify that, in contrast to typical liquid systems, the attoDRY1000 continues to operate without the typical interruption of cryogenics refill, allowing data acquisition around the clock for months."

attoDRY1000

top-loading 4K workhorse with superconducting magnets

The attoDRY1000 is the ultimate workhorse for quantum- and magneto-optics, providing a robust, cryogen-free platform that makes low-temperature science easy. It supports long-term, vibration-sensitive optical experiments across a 4 - 80 K temperature range, with higher temperatures achievable through manual pressure control. Its top-loading architecture combined with He-exchange gas enables fast, convenient sample exchange and efficient thermalization, providing a robust and user-friendly solution for demanding cryogenic measurements.



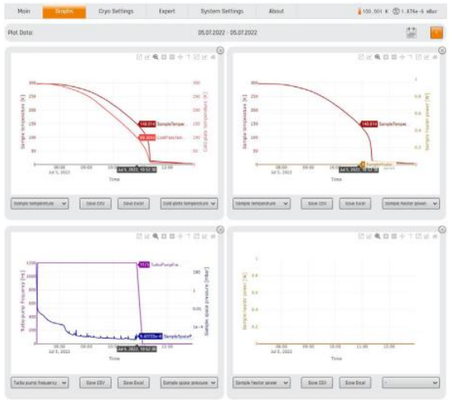
- cryogen-free & low vibrationcryostat platform with sample in exchange gas
  → no liquid helium required & enables SPM
- free-beam access in vector magnetic fields
  → workhorse for quantum optics & magneto-optics applications
- toploading insert with 49.7 mm sample space
  → fast turnaround with large sample space

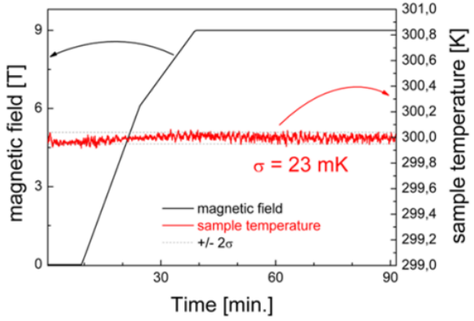
Full Automation for Next-Level Research

cryogenic research made simple

Full Automation - eNSPIRE

attocube's mission is to provide scientists with cutting-edge tools for state of the art research. Our cryostats are designed to be more than cooling devices—they are creative platforms for groundbreaking scientific ideas. That's why all automated cryostats (attoDRY800xs, attoDRY800, attoDRY2100, attoDRY2200) come equipped with eNSPIRE, an advanced control system that offers maximum comfort, freedom, and personalization.



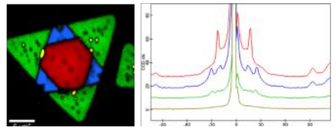


The perfect dry VTI: 9T at 300 K

Even at a sample temperature of 300K, the attoDRY2100 offers full magnetic field. Vice versa, the attoDRY2100 is perfect for temperature dependent measurements at applied magnetic field.

cryoRaman based on attoDRY2100

The turnkey cryoRaman combines a high-resolution confocal microscope with ultrasensitive optics for micro-Raman spectroscopy at low temperatures and in high magnetic fields. Sample positioning is achieved using xyz-positioners and a cryogenic-compatible piezo scanner, enabling raster-scanned Raman imaging with full spectral acquisition at each pixel.



attoDRY2100

automated top-loading cryostat with variable temperature & superconducting magnet

Unlock new possibilities in temperature-dependent research. The attoDRY2100 offers continuous operation down to 1.65 K, full temperature and magnetic-field control up to 300 K - all automated. A variety of superconducting magnets (solenoid up to 12 T and 2D/ 3D vector versions up to 9/3 T and 5/2/2 T) enable experiments in high magnetic environments with full field strength even at 300K. An integrated touchscreen and Ethernet/ LabVIEW/ MatLab/ Python control provide easy access to basic settings and advanced automated sweeps.

- low vibrations with free-beam optics in vector magnetic fields
  → for quantum optics & magneto-optics applications
- variable temperature (1.65 .. 300 K) @ full magnetic field
  → enables temperature-dependent measurements
- automated control via eNSPIRE electronics
  → web-server, live plotting & logging, versatile API

Breakthrough in Ultra-Low Vibrations Cryogenics

making ultra-sensitive measurements easy

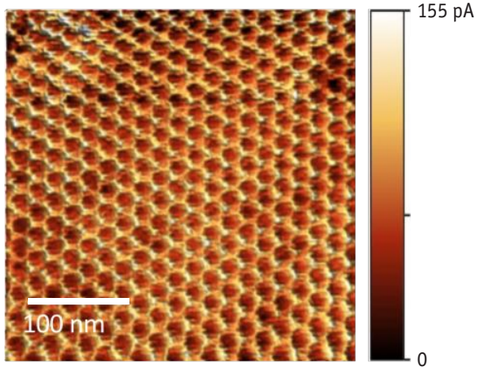
attoDRY2200

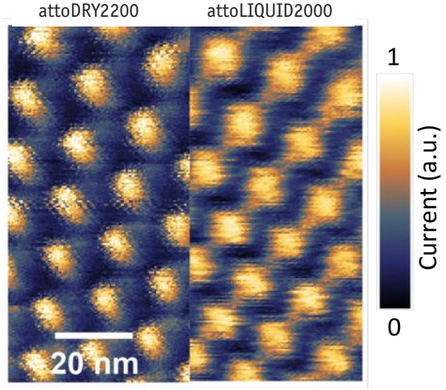
the benchmark for ultra-low vibration cryogenics

Ultra-Sensitive Measurements from 1.8 K to 300 K (hBN/Graphene)

The attoDRY2200 is a variable-temperature cryostat with maximum magnetic field at all temperatures. It features ultra-low vibrations in the entire temperature range, enabling the most demanding scanning probe experiments.

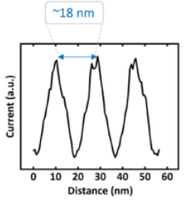
The attoDRY2200 is a variable temperature cryostat with maximum magnetic field being available at all temperatures. Moreover, it features ultra-low vibrations in the entire temperature range. An example thereof is a conductive-tip AFM (ct-AFM) scan of hBN/graphene bilayer at 70 K. One can see a high-resolution moiré pattern with a superlattice constant of 15 nm, and a lateral resolution of at least 7.5 nm.





Vibrations on par with Liquid Cryostat

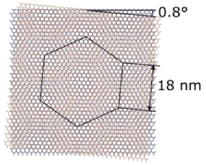
The comparison between attoDRY2200 and a liquid cryostat shows that both measurements yield the same resolution under similar measurement conditions. If anything, the ct-AFM image of tBLG shows slightly better signal-to-noise in the dry environment, confirming the excellent damping of vibrations in the attoDRY2200.



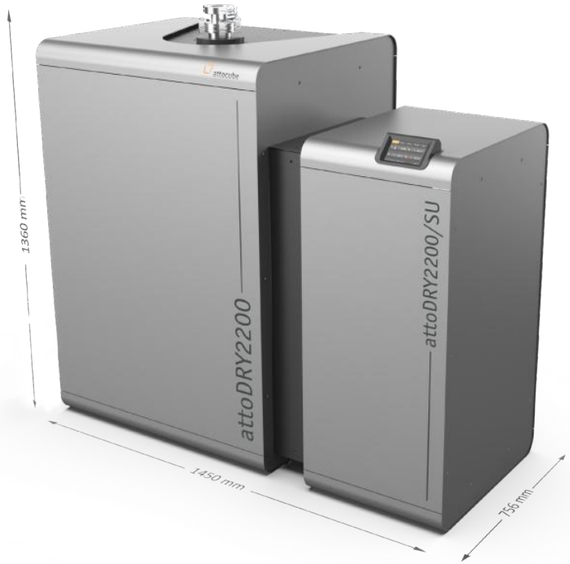
** Sample courtesy of Jiacheng Zhu and Kin Fai Mak (Cornell University, USA); access to attoLIQUID2000 cryostat courtesy of Istvan Kezsmarki (University of Augsburg, Germany).*

High-Resolution Moiré Pattern of Twisted Bilayer Graphene (tBLG)

To benchmark the performance of attoDRY2200, a ct-AFM measurement on twisted bilayer graphene (tBLG) was conducted. In our sample, two graphene sheets are twisted by an angle of 0.8°, which yields a moiré superlattice constant of 18 nm. The measurement above clearly shows this moiré superlattice with lateral resolution at least as small as half of the distance between two superlattice nodes, i.e., in this case 9 nm.



Specifically designed for the most demanding SPM experiments, the attoDRY2200 brings an efficiency leap in time-to-result through unmatched stability. It is the only system on the marked with proven vibration performance en par with liquid-He machines. He-exchange gas sample environment and various (vector) magnet options maximize user-friendliness and experimental flexibility.



- **the new benchmark in ultra-low vibration**
  → makes liquid cryostat obsolete even for sensitive SPM
- **automated control via eNSPIRE electronics**
  → web-server, live plotting & logging, versatile API
- **toploading probe with free-beam access in 3D fields**
  → versatile SPM platform for 2D materials research

attoDRY800

seamless cryogenic integration for maximum optical accessibility

Quantum optics experiments often require cryogenic temperatures together with free optical access and maximum space on the optical table for precisely arranged components. The attoDRY800 optical cryostat meets these demands through an innovative design, featuring an ultra-low-vibration cold breadboard fully integrated into the optical table, with the cryocooler located underneath. It provides unobstructed optical access from all directions and supports the integration of high-NA apochromatic objectives for minimal drift and optimal collection efficiency. As a closed-cycle system, it operates without liquid cryogens, offers automated temperature control from 3.8 to 320 K, and achieves extremely low residual vibrations as low as 2.6 nm due to a patented vibration isolation.

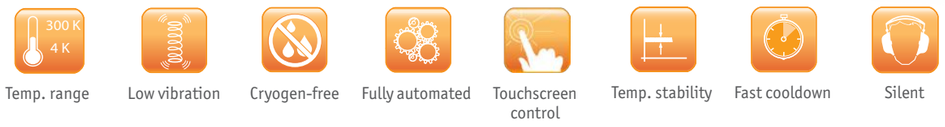
- cold breadboard integrated into optical table
  → obstruction-free work space & optical access
- market leading low drift & vibration performance
  → enables sensitive long-term measurements
- high quality vacuum system with turbo pump
  → keeps your samples clean

attoDRY800xs

compact standalone optical cryostat

Our most compact optical cryostat attoDRY800xs offers all key advantages of the original attoDRY800, such as low vibration performance, versatility through customizable vacuum shrouds adopted to the needs of your experiment, and automated temperature control, gas handling and remote control. The attoDRY800xs can be used to set up a self-contained experiment directly on its optical breadboard, or it can be placed adjacent to existing larger optical tables with fiber coupling between the optical elements. In a nutshell, we offer you what you love about the original attoDRY800 in a much smaller package – which fits into every lab!

- most compact standalone optical cryostat
  → fits in every laboratory
- cold plate integrated into optical breadboard
  → obstruction-free workspace & optical access
- fully customizable vacuum shrouds
  → suited for wide variety of applications



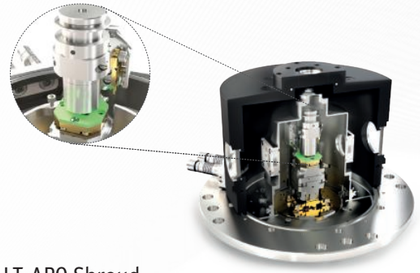
Tailored Solutions for the attoDRY800 Series

find the set-up that perfectly matches your needs

Various Standard Shrouds

Basic (Standard Shroud)

Designed for room temperature optics, it provides a flexible sample hoder with which a short minimum working distance of about 3.5 mm.

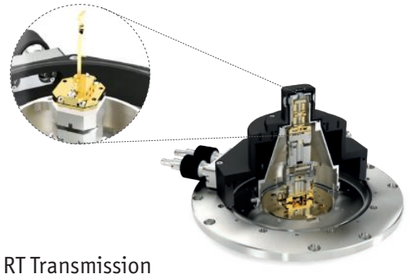


LT-APO Shroud

Using our low temperature apochromatic objectives with high numerical apertures, the setup maximizes collection efficiency for weak optical signals, allows long-term stability for diffraction limited measurements and eliminates drifts.

RT-SWD Shroud

Optimized for high-NA room-temperature objectives, a precise x-y-z positioner stack is used to align the sample. With an ultra-short working distance upgrade, the working distance can be as small as 1 mm.



RT Transmission

Designed for transmission experiments, LT-positioners enable moving the sample with respect to a free-beam optical setup on the optical table or breadbord.

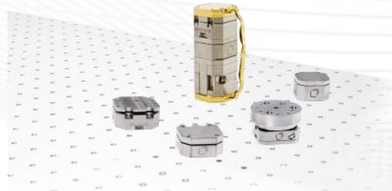
Customized Shrouds

Anything above the table surface can be customized according to the technical requirements and preferences of the user and his/her application. We will be happy to assist in designing your own pecialized low temperature setup and corresponding vacuum shroud. Please do not hesitate to contact us if you have special requests.

vacuum shrouds webpage overview

Features and Accessories

customize the setup to your exact experimental requirements

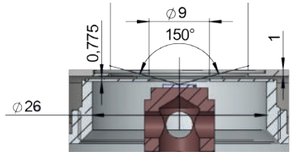


Low Temperature Nanopositioners

Combine many degrees of freedom, or more than one stack of positioners to fulfill all requirements of your application! The ATC100 link ensures a perfect thermalization of your sample that is straightforward to mount and easy to use.

LT-APO Shroud

Using a LT-APO low temperature objectives with high numerical apertures allows to maximize the collection efficiency over a broad wavelength range when optical signals are weak.



RT-SWD Shroud

Designed for room temperature optics, the sample sits on a xyz positioner stack to align the sample precisely in the optical spot of any RT objective.

LT-APO Shroud RT Transmission

Designed for transmission experiments using RT optics, the setup allows to move the sample in x-y direction into the region of interest in sample plane.

Additional Features and Accessories

A wide range of additional upgrades is available, including further electrical feedthroughs for DC and high-frequency (RF) lines as well as optical fiber feedthroughs. We also offer extensive mechanical cu tomization options such as various flexlines, non-magnetic table solutions, and multiple optical table sizes. Please contact your attocube representative for further details.

Leap in Compact & Efficient Cryogenics

enabling industrialization of quantum technologies

attoCMC

compact, rack mountable cryostat system

Air Cooling & 19” Rack Form Factor

The attoCMC combines the IGLU compressor with a high-performance cryostat and is designed for straightforward integration into 19-inch rack systems. The low heat generation of the IGLU compressor allows the usage in most vented or climatized rooms without additional cooling infrastructure: it does not require cooling water or other external supplies besides the single-phase main power connection.

Turnkey Cryostat for OEM Applications

The compact cryostat package including the IGLU compressor requires no expert installation, and literally runs out-of-the-box: just plug it into a regular wall socket, and it automatically cools down to less than 3 K.

It streamlines the OEM application process by being controlled through simple commands, eliminating the necessity for external electronics or programming to control the cryostat functionalities.

Easy User Access for Fast Integration

The attoCMC is easily accessible through a front-facing sliding coldspace, allowing swift integration and support, even when the system is rack-mounted. Additionally, versatile and easy-to-install feedthrough options minimize the time until the system is fully operational and provide flexibility to the user for his/her specific application.

Efficiency is a defining characteristic of attocube’s Compact Mobile Cryogenics product line: The attoCMC is effortlessly adaptable to diverse environments while requiring minimal space and electrical power. This makes it the top choice for a broad spectrum of applications that demand cryogenically cooled sensorics, including SNPSDs, and quantum devices like single photon sources. Its ease of deployment and compactness makes it a scalable solution for various OEM applications and sets a new benchmark in cryostat technology.

- most compact full 2.3 K cryostat on the market
  → integration of cooled quantum devices in 19” rack systems
- air-cooled, low heat generation (1kW), single phase power
  → autonomous from special infrastructure
- fully automated cooldown & operation
  → user-friendly push button solution

attoDRY1000

technical specifications

Find the complete specs on our website

General Specifications	
technology	low vibration, pulse-tube based closed-cycle cryostat, designed for confocal microscopy
sample environment	He exchange gas, 4-5 different pressure ranges depending on desired sample temperature, requires manual control
sample space	49.7 mm diameter probe bore fitting all attocube inserts
usability	reliable 4K and magnetic field environment
vibration & acoustic noise damping system	proprietary low vibration design
Performance Data	
temperature range	4 .. 80 K (guaranteed), 4 .. 300 K (expected); optional temp. controller required
base temperature	< 4K
cool down time of sample	approx. 2 h (depending on insert)
Options and Upgrades	
superconducting magnet	solenoids: 9 T, 12 T, vector magnets: 9/3 T, 1/1/1 T, 9/1/1 T, 5/2/2 T
Compatibility	
confocal microscopes	attoCFM I, CFM base kit
atomic force microscopes	attoAFM I , AFM upgrade options (MFM, KPFM, PFM, conductive-tip AFM), attoAFM III
transport measurement	--

Find the complete specs on our website

attoDRY2100

technical specifications

General Specifications	
technology	low vibration, pulse-tube based closed-cycle cryostat, designed for magneto-optical applications
sample environment	He exchange gas
sample space	49.7 mm diameter probe bore fitting all attocube inserts
usability	fully automated temp. and mag. field control via integrated touchscreen, web interface or LAN API
vibration & acoustic noise damping system	proprietary low vibration design
Performance Data	
temperature range	1.65 .. 300 K (automated control)
base temperature	1.65 .. 1.8 K (for standard inserts)
cool down time of sample	approx. 3 .. 5 h (depending on insert)
Options and Upgrades	
superconducting magnet	solenoids: 9 T, 12 T, vector magnets: 9/3 T, 1/1/1 T, 9/1/1 T, 5/2/2 T
Compatibility	
confocal microscopes	attoCFM I, CFM base kit, attoRAMAN
atomic force microscopes	--
transport measurement	atto3DR

attoDRY2200

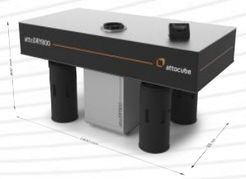
technical specifications

Find the complete specs on our website

General Specifications	
technology	ultra-low vibration, pulse-tube based closed-cycle cryostat, designed for scanning probe microscopy applications
sample environment	He exchange gas
sample space	49.7 mm diameter probe bore fitting all attocube inserts
usability	fully automated temp. and mag. field control via integrated touchscreen, web interface or LAN API
vibration & acoustic noise damping system	benchmark ultra-low vibration design
Performance Data	
temperature range	1.8 .. 300 K (automated control)
base temperature	1.65 .. 1.8 K (for standard inserts)
cool down time of sample	approx. 5 .. 8 h (depending on insert)
Options and Upgrades	
superconducting magnet	solenoids: 9 T, vector magnets: 1/1/1 T, 9/1/1 T
Compatibility	
confocal microscopes	attoCFM I, attoCFM IV, attoAFM/CFM
atomic force microscopes	attoAFM I , AFM upgrade options (MFM, KPFM, PFM, conductive-tip AFM), attoAFM III, attoAFM/CFM
transport measurement	atto3DR

attoDRY800

technical specifications



Find the complete specs on our website

General Specifications	
technology	low vibration, closed-cycle cryostat intimately integrated into optical table (sold separately)
sample environment	cryogenic vacuum, sample cooled via braids (ATC100)
sample space	75 mm (diameter)
usability	fully automated temperature control (vacuum, cooldown, T control, warmup), all pumps integrated, USB interface for remote control
vibration & acoustic noise damping system	proprietary low vibration design
Performance Data	
temperature range	3.8 .. 320 K (depending on configuration)
base temperature	< 4.5 h to 5 K (depending on thermal load)
cool down time of sample	< 5 nm (peak-to-peak@1500 Hz)
Size and Dimensions	
cryostat	430 x 710 x 890 mm³
optical table	standard size 900 mm x 1800 mm x 305 mm (leg height 597 mm), other table sizes available; metric or imperial mounting threads
Options and Upgrades	
vacuum shroud	basic (standard shroud); upgrade options: RT-SWD, RT-USWD, LT-APO objective, HV objective, Photonic Probe Station, or customized height, diameter, windows & working distance
electrical access & feedthroughts	36 customer wires (DC) included, heat sunk @ 4 K electrical (DC, HF), optical fibers, gas capillary (on request)
Compatibility	
confocal microscopes	cryoRAMAN
probe stations	photonic probe station, electrical probe station

attoDRY800xs

technical specifications

Find the complete specs on our website

General Specifications	
technology	compact optical cryostat integrated into optical breadboard
sample environment	cryogenic vacuum, sample cooled via braids (ATC100)
sample space	75 mm (diameter)
usability	fully automated temperature control (vacuum, cooldown, T control, warmup), all pumps integrated, USB interface for remote control
vibration & acoustic noise damping system	proprietary low vibration design
Performance Data	
temperature range	3.8 .. 320 K (depending on configuration)
base temperature	< 4.5 h to 5 K (depending on thermal load)
cool down time of sample	< 5 nm (peak-to-peak@1500 Hz)
Size and Dimensions	
cryostat	430 x 710 x 890 mm³
Options and Upgrades	
vacuum shroud	basic (standard shroud); upgrade options: RT-SWD, RT-USWD, LT-APO objective, HV objective, Photonic Probe Station, or customized height, diameter, windows & working distance
electrical access & feedthroughts	36 customer wires (DC) included, heat sunk @ 4 K electrical (DC, HF), optical fibers, gas capillary (on request)
Compatibility	
confocal microscopes	cryoRAMAN
probe stations	photonic probe station, electrical probe station

Find the complete specs on our website

attoCMC

technical specifications

System Description	
self-contained compact cryostat	19-inch rack mountable, 10U
integrated air-cooled compressor	speed regulation - interface for remote control
sliding vacuum space for cold plate access	crycogenic vaccum
Temperature Performance (Base System)	
base temperature	2.3K
cooling power	50 mW @ 2.8 K
integrated thermometer	(4-wire, connected to base wiring)
General Specifications	
dimensions (including compressor)	446 x 443 x 641 mm, 17.5“ x 17.5“ x 25.25“ main body in rack configuration, excluding backside connections
leak rate of vacuum	< 5e-9 mbar l/s
weight	approx. 100kg including compressor
country of origin	Federal Republic of Germany
feedthrough options	5 Feedthrough plates for wiring upgrades 2x KF25 flanges for additional fiber or wire integration
Electrical Specifications	
maximum input power	< 1.4 kW
AC input voltage and line frequency	single phase 230 V, 50 Hz/60 Hz 110 V option with external transformer
remote operation	ethernet interface (ADS and webserver)

attocube
WITTENSTEIN group

	attoCMC	attoDRY800(xs)	attoDRY1000	attoDRY2100	attoDRY2200
base temperature	2.3 K		4 K	1.8 K	1.8 K
temperature range		3.8 .. 320 K	4 .. 70 K	1.8 .. 300 K	1.8 .. 300 K
variable temperature		●	○	●●	●●
low vibration		●	●	●	●●
automated temperature control	●	●		●	●
superconducting (vector) magnet			●	●	●
toploading (sample in exchange gas)			●	●	●
sample in vacuum	●	●			
optical access to sample		●●	●	●	●
attoAFM I			●	○	●●
attoAFM III			○		●●
attoAFM/CFM			○		●●
CFM base kit			●●	●●	●●
CFM base kit			●●	●●	●●
cryoRaman		●●		●●	●●
atto3DR				●	●
19-inch rack compatibility	●●	● (xs/IGLU)			
req. infrastructure	single phase	three phase, water/air cooled	three phase, water cooled	three phase, water cooled	three phase, water cooled
IGLU compressor	incl.	optional			

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○ yes, but with limited performance
● yes, performs very well
●● yes, performs excellent