



# Titan Krios™

## Visualizing Life at the Molecular Level

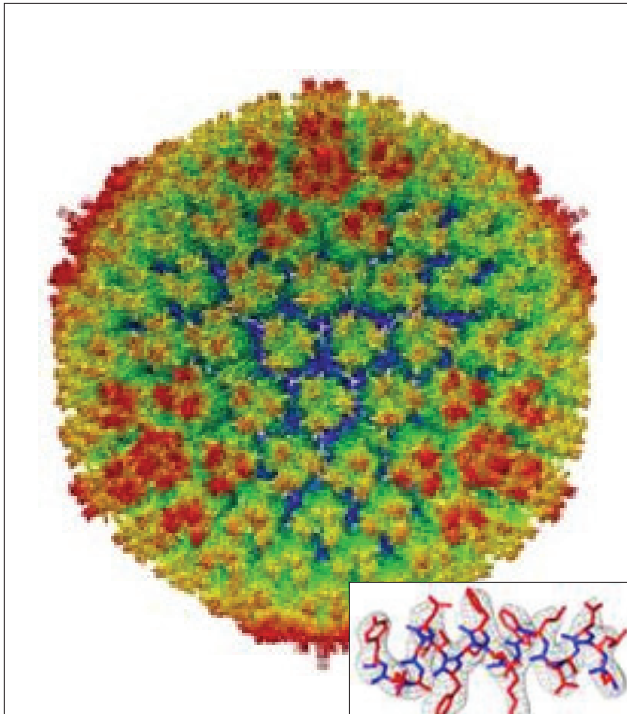
The Titan Krios™ transmission electron microscope (TEM) is tailored for use in protein and cellular imaging. Its revolutionary cryo-based technology and stability permits a full range of semi-automated applications, including: 2D electron crystallography, single particle analysis, cryo electron microscopy, and dual-axis cellular tomography of frozen hydrated cell organelles and cells. Cryo techniques preserve sample integrity by maintaining the sample in its natural condition and state. The Titan Krios' versatility ensures that you will be able to perform today's experiments and as well as address new research problems in the future.

The Titan Krios is the most powerful and flexible high resolution electron microscope for 3D characterization of biologicals samples. The innovative enclosed platform combines excellent optical performance and thermal and mechanical stability with a high throughput sample loader. The Autoloader™ sample loader allows for loading of up to 12 samples in a specially designed Autogrid™ ring. In addition, automated dual-axis tomography the specially designed holder that allows the sample to rotate 90 degrees in plane while being present in the column. This provides a reduction of the missing wedge information to a missing cone.

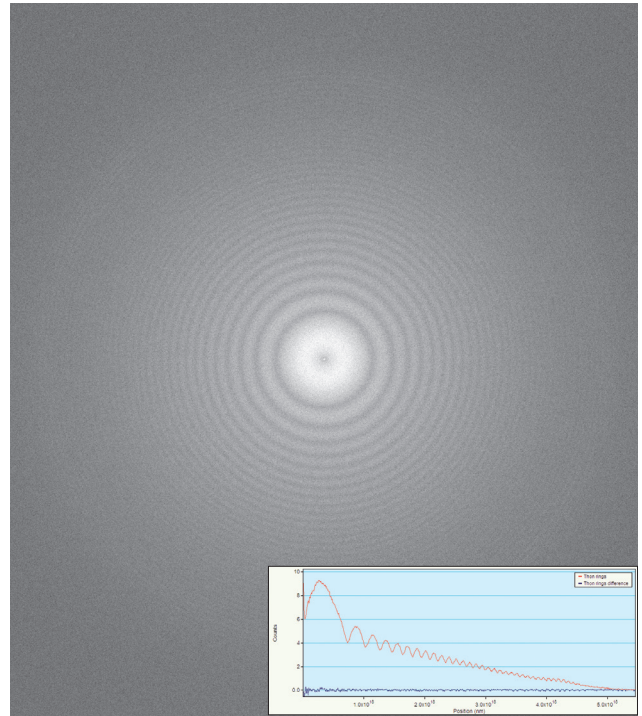
The flexibility of operating the Titan Krios in the range of 80-300 kV allows for optimizing high tension to the requirements of the material under examination - ranging from vitrified suspensions to unstained cryo sections. The new digital user interface gives the freedom to operate the Titan Krios remotely in ambient, normal light conditions. The high speed digital camera (flu cam) – that has taken over the role of the fluorescent screen - and the innovative user interface improve the microscope's ease of use. It masters the complete dynamic range from live observation of focused high intensity beams to low dose applications and diffraction.

### Key benefits

- Platform for high resolution, dual-axis cryo-electron tomography, single particle analysis and electron crystallography
- Robotic loading of up to 12 frozen, hydrated sample
- Parallel illumination over a wide and variable field of view, crucial for cryo-electron tomography and single particle analysis
- Minimal thermal drift due to ConstantPower™ lenses
- Ultra-robust scintillator design for live observation of focused high-intensity beams
- Ambient light conditions for operation, digital viewing and digital microscope control
- Reduced installation and operating requirements: environmental instrument enclosure provides optimal thermal and acoustic shielding



**Figure 1:** Atomic structure of the human Adenovirus at 3.6 Angstrom by cryo-EM. Image courtesy of Hong Zhou, University of California at Los Angeles, USA



**Figure 2:** Fourier transform image showing Thon rings at liquid nitrogen conditions and the associated frequency spectrum.



**Figure 3:** The environmental instrument enclosure provides optimal thermal and acoustic shielding.



**Figure 4:** Primary control unit of the Titan Krios can be placed up to 15 meters from the microscope for ease of operation.

### Technical highlights

- Ultra-stable Schottky field emitter gun
- New three lens condenser system for parallel sample illumination along with quantitative indication of convergence angle and size of illuminated area
- Flexible high tension from 80 to 300 kV
- Environmental enclosure to relax the acoustic room requirements with 20 dBC and 0.8° C peak-to-peak temperature variation
- Modular column design
- Patented, accurate mechanical stacking system
- ConstantPower™ lens design for optimal mode switching between LM-HM imaging and diffraction
- Cryo stage allowing in-plane 90 degree sample rotation needed for dual-axis tomography
- Low hysteresis design to minimize cross-talk between optical components
- Symmetric C-Twin objective lens with wide pole piece gap design of 11 mm
- Automatic apertures
- Rotation-free imaging
- Computerized 5-axes specimen stage with  $\pm 70$  degree alpha tilt
- Cryo Autoloader for robotic sample handling and contamination-free loading of up to 12 samples
- Low Dose Software suite for minimized electron dose operation during cryo-TEM
- New fully digital system for remote controlled operation

### Digital camera and remote control suite

- High frame rate: up to 40 frames per second
- Automatic adaptable gain
- Large magnification range
- Digital zoom
- Automatic high dynamic range (HDR) mode
- Ultra-robust scintillator design for live observation of focused high intensity beams
- Live FFT
- False color imaging
- All manual and automatic alignments can be executed with the search and view camera
- Primary control unit can be placed up to 15 meters from the column

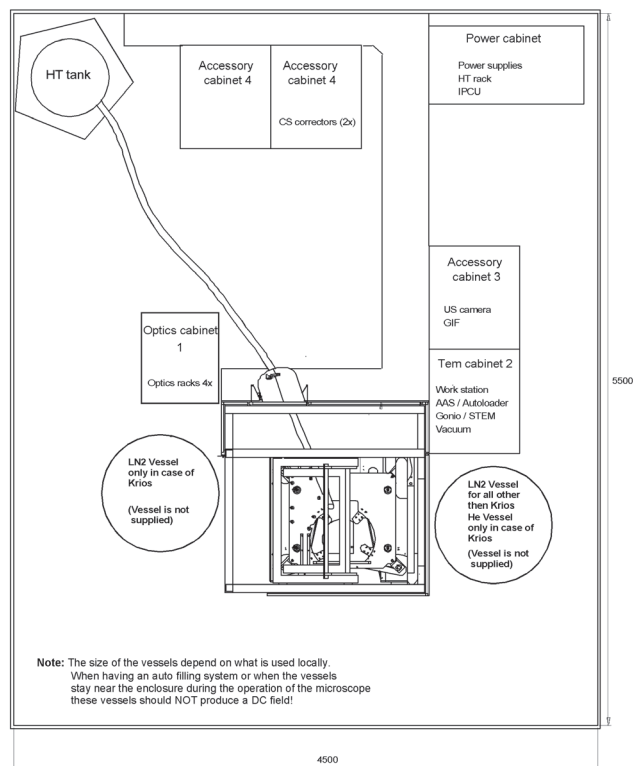
### Detectors (depends on configuration)

- HAADF detector
- On axis DF/BF detectors
- Gatan US1000/US4000 camera
- Eagle series cameras
- Energy filter Quantum 963
- Low-noise plate camera
- Falcon™ Direct Electron Detector



## Installation requirements

- Environment temperature: 18° C to 23° C
- Temperature stability: 0.8° C P-P / 24 hours (which is compatible with office air-conditioning class ASHRAE 2001)
- Heat dissipation into air nominal: 4420 W
- Door height: 2.31 meter
- Door width: 1.00 meter
- Ceiling height: 3.80 meter
- Floor space required for operation and servicing  
5.78 meter x 6.54 meter
- Weight distribution maximum: 1270 kg/m<sup>2</sup>
- Power voltage: 3 phase including neutral and earth 398 V, 50/60 Hz (+6 %, -10 %)
- Frequency: 50 or 60 Hz (±3 %)
- Power consumption: 11.5 kVA (with all microscope options)
- Electrical connection: 4-wire (4 mm conductors), 3 phases and neutral + two separate earth wires and single phase for water cooler 230 V, 4 kVA
- Cooling water required (depends on water cooling unit ordered)
- Double earth connection required
- Compressed air supply with pressure range of 6 bar to 7 with pressure fluctuations of 0.1 bar / minute; oil content must not exceed 0.08 mg/ml bar
- Nitrogen (N<sub>2</sub>) supply with pressure range of 1 bar to 10 bar
- Sulfur Hexafluoride (SF<sub>6</sub>) gas with proper ventilation
- Pre-vacuum pump outlet
- Liquid nitrogen LN<sub>2</sub> Dewar size at the microscope: 2.5 liter
- The Autofill system requires a main supply tank with an overpressure maximum of 0.7 bar ( approximately 10 psi); exceeding this value will result in the Autofill function not operating within specification
- LAN connection for Remote Access Program for Interactive Diagnosis (RAPID)



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TÜV Certification for design, manufacture, installation and support of focused ion- and electron-beam microscopes for the Electronics, Life Sciences, Research and Natural Resources markets.

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