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DATASHEET

Talos Arctica Cryo-TEM

Resolve 3D macromolecular structures quickly, efficiently, and accurately

The Talos Arctica Cryo-TEM is a 200 kV FEG Transmission and Scanning Transmission Electron Microscope (S/TEM). It is a powerful, stable, and highly automated system optimized for high-resolution 3D imaging of proteins and macromolecular assemblies as well as high-resolution cellular tomography.

The Thermo Scientific™ Talos Arctica™ Cryo-TEM is a 200 kV FEG Transmission. With its innovative design to increase throughput, stability and ease of use, it enables scientists to quickly obtain better insight and understanding of macromolecular structures, cellular components, cells and tissues in three dimensions. Its revolutionary cryo-based technology and stability permits a full range of semi-automated applications including: single particle analysis, electron crystallography and cryo-electron tomography.

Shorter time to high quality data

The platform design combines an excellent optical performance and thermal and mechanical stability with a unique, automated, high throughput (cryo) sample loader/unloader system for multiple sample handling at liquid nitrogen temperatures.

The Thermo Scientific ConstantPower™ C-TWIN objective lens delivers outstanding optical performance to help ensure an optimal balance of contrast and resolution. This ultra-stable platform includes a Piezo-enhanced stage (optionally available at additional cost), stable optics and a rugged system enclosure for maximum thermal and mechanical stability.

Key Benefits

Increased data acquisition speed: Acquisition speeds have been improved up to 3 times for tomography and up to 1.5 times for single particle analysis when EPU is used compared to side entry loading systems

High data throughput: Robotic sample handling and automated loading for up to 12 samples enhances up to 40% in data throughput

Seamless integration: The Talos Arctica Cryo-TEM is fully compatible with our applications software, Phase Plate and detector solutions within our integrated cryo-electron microscopy workflow

Unattended operation: Autofilling of liquid nitrogen and powerful applications software allows for continuous unattended platform operation and automated data acquisition

Excellent data quality: Optimized for 80-200 kV operation, equipped with a constant power C-TWIN objective lens for optimal contrast/resolution balance

Sample quality: Contamination free sample loading and automated liquid nitrogen filling results in an increased sample life time and quality

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User friendly for everyone

The Talos Arctica Cryo-TEM is a fully digital S/TEM, which incorporates a new digital search-and-view camera (SmartCam), specially designed by Thermo Fisher Scientific. This high-speed digital camera replaces the conventional fluorescent viewing screen and gives users optional freedom to operate the microscope from a distance. The Talos Arctica Cryo-TEM is designed with local remote operation capability as standard. This allows for operation from within the microscope room, or from an adjacent room which is a maximum of 10 m away from the computer.

The Talos Arctica Cryo-TEM features the our proprietary Thermo Scientific Velox™ software for easy-to-use STEM acquisition and analysis utilizing the Windows® 10 operating system. All microscope components, like the electron gun, the optical elements, the vacuum system and the stage, are digitally controlled. The task-oriented user interface allows users to automatically recall all optimized operating conditions including lens settings, gun parameters, optical alignments, and aperture alignments for all the different techniques such as TEM, STEM, and low-dose. Likewise, all detectors, such as the Falcon camera, and STEM detectors, are computer controlled. The acquisition of data with these detectors is embedded in the user interface and can be automated for certain acquisition processes, such as TEM / STEM tomography data acquisition and EPU, single particle data acquisition. Because of this sophisticated computer system, the Talos Arctica Cryo-TEM is especially suited for multi-user and multi-disciplinary environments and therefore also suitable for newly emerging customer groups who have their background in adjacent applications like crystallography.

Ready for the future

The Talos Arctica Cryo-TEM applications dedication ensures that you will be able to perform today's experiments and as well as address new research problems of the future.

Technical Features

- C-TWIN objective lens (Cc and Cs 2.7 mm), ensuring a good optimum for tilt range, resolution, and contrast
- Autoloader ensures automated and contamination-free loading of multiple samples
- Embedded liquid nitrogen AutoFill system enabling long-term cryo stability
- Ultra-high sample stability and drift performance due to integrated low temperature sample holder design
- Vitreous ice specimen quality guaranteed for 24 hr in the microscope, due to oil-free vacuum system and fixed cryo-box surrounding the sample area
- Full integration with Thermo Fisher's single particle and tomography solutions
- SmartCam digital search-and-view camera improves the handling of all applications
- Workstation including two 24" widescreen LCD monitors and table improves the operator comfort and allows relaxed working in an ergonomic environment
- Automatic aperture system in combination with the SmartCam prepares the Talos Arctica Cryo-TEM for full remote operation

Test	Specification	Comments
X-Ray Safety	X-ray radiation ≤ 1 µSv/hr at 0.1 m distance	Safety test, performed with X-ray sensor.
FEG Probe Current	Probe current at 1 nm spot size X-FEG: > 1.2 nA	The probe current specification ensures sufficient brightness of the FEG.
Information Limit	≤ 0.23 nm at zero specimen tilt ≤ 0.34 nm at -70° and +70° specimen tilt	Young's fringe images showing TEM information limit.
Thon Rings	Thon rings visible beyond a spatial frequency of 2.7 nm-1 (corresponding to 0.37 nm resolution) in the rotationally averaged power spectrum of an image of a PtIr specimen at -2 µm defocus.	Thon rings demonstrate the transfer of contrast by the microscope at a defocus value that is commonly used for single particle data acquisition. An additional test is performed at -1 µm defocus for reference only (specification must be met at -2 µm).
Drift after Specimen Exchange	Maximum drift values after exchange 5 min: 1.2 nm/s (LM Overview) 15 min: 0.45 nm/s (Target Areas) 30 min: 0.25 nm/s (Start Tomo) 60 min: 0.05 nm/s (Start EPU)	Drift measurement (5 minute running average) performed immediately after specimen exchange, demonstrating the behavior under normal use conditions. The drift values correspond to typical use-case requirements.
Autoloader Performance	The following procedure should run without errors: each of the 4 cassettes is filled with 6 AutoGrids and docked. Next, an inventory is made and each AutoGrid is loaded into the column once.	Performance test, demonstrating the full load/unload cycle and proving the compatibility of the autoloader parts delivered with the system. Slot positions 1 to 12 of the cassettes are alternately filled and empty.
STEM resolution (Option)	< 0.23 nm	Lattice reflections visible in power spectra of images acquired in STEM mode on a gold on carbon specimen.
Tomography (Option)	Reproducibility X, Y ≤ 0.4 um during Alpha tilt from -70° to +70° Eucentricity X, Y ≤ 2 um during Alpha tilt from -70° to +70° Eucentricity defocus ≤ 4 um during Alpha tilt from -70° to +70°	Calibrations including auto-functions, holder calibration with evaluation of 3-holder measurement and Tomography specific calibrations.
EPU (Option)	Sample data set of 15 images, demonstrating that the proper target areas were imaged.	EPU is set up to acquire 3 images of the edges of 5 different foil holes. The orientation of the edges in the acquired data set demonstrates that the target areas were imaged properly.

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Notes

Find out more at **thermofisher.com/EM-Sales**

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