

Ceta 16M

(with optional Speed Enhancement and data management)

All-in-one camera functionality for highest performance and dynamic imaging

The Thermo Scientific™ Ceta™ 16M is a camera solution delivering sensitive as well as dynamic imaging with large field of view. This unique combination follows the natural workflow in TEM imaging: from fast navigation to find the area of interest—to easy optimization of the image quality via optical adjustments—to the final result: a 4k × 4k image unrivaled in quality and detail.

All-in-one camera

The Ceta 16M camera combines high speed (up to 40 frames per second at full resolution with the optional speed enhancement) and high sensitivity with a large field of view to allow navigation, optimization and high quality imaging functions from a single camera. This eliminates time consuming retraction and insertion of multiple cameras, and compensation for the resulting changes in illumination and magnification, providing easier and more accurate operation with faster time-to-data. Additionally, because the sample's exposure to the electron beam is reduced, potential damage to the sample is minimized.

Superior performance for faster answers

Ultimate imaging performance and robustness in all applications is assured with the Ceta 16M camera. The large 6 × 6 cm², 4k × 4k CMOS sensor with 14 μm pixel size is combined with a high sensitivity scintillator. The flexibility to adapt to any high tension setting delivers superior images from any material.

The instant-zoom feature enables operators to quickly see features of interest on the screen with the power of 16M pixel resolution, while direct wiring CMOS sensor technology further enhances rapid time-to-data.

Optimized settings for any application

The Ceta 16M camera is embedded in the workflow of the latest Thermo Scientific TEM operating software. The software provides optimized camera settings for both still image and movie recording. Easily switch between low and high dose, and even diffraction mode acquisition, at the push of a button. Automatic fast frame adding enables more than 16 bit dynamic range acquisition to extend the use of the Ceta 16M camera into the demanding application space of electron diffraction imaging.

Key Benefits

Easiest, fastest operation: Push-button mode switch functions and fast 4k × 4k CMOS based sensor assure rapid access to the highest quality images.

Consistently clear images, from mesoscopic to atomic scale: Largest field of view combined with high speed readout delivers clear images quickly, even when moving from mesoscopic to atomic scales.

Optimum performance at any high tension (20–300 kV): High sensitivity, robust fiber optic-coupled scintillator combines with large 14 μm pixel size to deliver the best quality images regardless of high tension selection.

Optimized settings for any material or application: Select low dose imaging for beam sensitive materials, or high dose for diffraction applications, with more than 16 bit dynamic range using fast frame-adding

Compatible with post-column filters and spectrometers: The bottom mounted Peltier cooled sensor is positioned on-axis for minimum distortions and retractable, which enables easy integration with post-column filters and spectrometers.

Movie acquisition for dynamic studies: The optional “speed enhancement” solution enables recording of high quality 4k × 4k movies at up to 40 fps (standard 1 fps) or 512 × 512 movies at up to 320 fps (standard 25 fps).

Data storage: The optional speed enhancement (with analysis computer and/or storage server) solution enables capture, storage and transfer of TB file size movie recordings.

Dynamic imaging

Fast, high quality movie recording is pivotal to understand material kinetics in dynamic microscopy. The camera's integration in our data acquisition solutions* assures acquisition of high quality, 16 bit (with frame summing) dynamic range movies at 1 fps with 4k x 4k pixel resolution (with optional speed enhancement: up to 40 fps) and, e.g., 25 fps with 512 x 512 pixel resolution (with optional speed enhancement: up to 320 fps). Sophisticated data management with the optional speed enhancement enables handling of TB data files and therefore movie recording of at least 40 minutes in full resolution 4k mode.

System requirements

Ceta 16M camera is available on FEI Talos, Themis 200/300, Themis Z, Metrios and Krios systems.

Ceta 16M Specifications

Operation voltage	20–300 kV	
Sensor	4,096 x 4,096, 14 µm pixel CMOS	
Camera architecture	Fiber optic coupled scintillator (1:1)	
Recording frame rate	Standard:	Speed enhancement:
	4k x 4k 1 fps	4k x 4k 40 fps
	2k x 2k 8 fps	2k x 2k 80 fps
	1k x 1k 18 fps	1k x 1k 160 fps
	512 x 512 25 fps	512 x 512 320 fps
Imaging performance in 4k x4k mode		
DQE @ 0.5 Nyquist	> 9% @300 kV > 9%@200 kV	
MTF @ 0.5 Nyquist	> 16%@300 kV > 17%@200 kV	
Detection modes	Triple mode: Low dose, Medium dose, High dose Sampling 1x, 2x, 4x, 8x	
Dynamic Range	> 16 bit with fast frame summing	
Duty cycle in movie mode	100% in rolling shutter mode	
TEM shutter	Pre-specimen, post specimen	
Movie mode shuttering	Electronic (rolling shutter) or TEM shutter (camera controlled)	
Conversion efficiency	7 counts/primary electron (typical) @200 kV 5 counts/primary electron (typical) @300 kV	
Non linearity	<1%	
Cooling	Sensor Peltier cooled when connected to TEM water line	
Mounting position	On-axis, bottom mounted, retractable	
Computer platform	Windows 7, 64 bit	
Network Interface	Standard:	Speed enhancement:
	Gigabit Ethernet	10 Gigabit Ethernet to Storage Server/Analysis PC 1 Gigabit Ethernet to TEM PC
Data management and storage	Standard:	Speed enhancement:
	HD space of microscope	4 TB SSDs on electronic board
	PC	4 TB storage in analysis PC (optional) 66 TB data storage server (optional)
X-ray safety	96/29/EURATOM - Ionizing Radiation	

*Reference specific platform specifications for information on the latest data acquisition software.

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