

MiniTEM™ data sheet

MiniTEM has been developed specifically for nanoparticle characterization and this has determined the resolution and voltage specifications of the system.

- Resolution of 1 nm
- Accelerating voltage 25kV

The low accelerating voltage compared to traditional transmission electron microscopes (TEM) allows for maximum contrast. Novel technical solutions allow for a compact and vibration tolerant design. The system can be plugged into a standard wall socket (110/230V) and can be placed in a standard laboratory setting.

Automatically set actions for easy start up

- Illumination
- Focus
- Beam alignment
- Exposure

Automated imaging and particle analysis

The automation in MiniTEM goes beyond the settings of the microscope and camera. It allows for automatic image acquisition and subsequent particle analysis and data presentation.

Waypoints are easily selected on the grid to be analyzed. Images are automatically acquired at the selected waypoints. The particles in the selected images can automatically be analyzed for morphology, integrity, purity, aggregation or any other characteristic that has been built into the automation workflow by the user. The data can be presented as a list, a histogram, a scatter plot or a box plot.

Pattern recognition and machine learning capabilities enable MiniTEM to perform advanced image analysis resulting in particle characterization, classification and measurements which are statistically relevant. A large portion of this is thanks to the ability to automatically acquire and analyze large subsets of images.



Specifications

Microscope

Specimen size	Standard \varnothing 3.05 mm grids
Specimen exchange time	Approx. 3 min

Image mode

Nominal accelerating voltage	25kV
Resolving power	1.0 nm
Total magnification	3,400 - 1,300,000x
Field of view	100 × 0.25 μ m
Magnification in Low mag regime	1500x
Field of view in Low mag regime	250 μ m
Focal length	1.34 mm
Cs (spherical aberration coefficient)	1.03 mm
Cc (Chromatic aberration coefficient)	1.05 mm
α_{theor} (theoretical aperture angle)	1.2 × 10 ⁻² rad

Electron optics

Condenser lens	Magnetostatic & electrostatic
The smallest illuminated area	500 nm
Condenser aperture	\varnothing 50, 30 μ m
Objective lens	Magnetostatic
Objective aperture	\varnothing 50, 30 μ m
Projection lens	Double electrostatic

Electron gun

Type	SE Cathode ZrO/W[100]
Current density	0.3 mA _s ⁻¹
Lifetime	>2,000 hours

Vacuum

Airlock system: turbomolecular pump	10-5 mbar
Sample chamber: ion getter pump	10-8 mbar
Gun chamber: ion getter pump	10-9 mbar

Light optics

Objective Olympus M20x	NA*0.75
Objective Olympus M4x	NA*0.13

* Numerical aperture

Camera (ViroCam)

CCD sensor	Truesense KAI-04070
Pixel size	7.4 × 7.4 μ m
Digitalization	16 bits
Image size, full frame	2048 × 2048 pixels
Image size, live mode	1024 × 1024 pixels
Live view frame rate	24 fps
Interface	Gigabit ethernet
Cooling	Passively cooled

MiniTEM computer

Hardware

CPU	Intel i7
RAM	16 GB
GPU	Supporting Open CL 1.1
VRAM	16 GB
Data storage	512 GB SSD

Software

Operating system	Windows 10
Framework	.Net 4.6
Imaging and analysis	MiniTEM

Mains input

Voltage/frequency	100–240 V/50–60 Hz
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Power ratings

Standby mode	60 VA
Operation consumption	410 VA
Maximum consumption	600 VA
Camera	60 VA
Computer and monitor	approx. 350 VA

Weights and dimensions

Electron and light optics

Weight	140 kg
Dimensions (w × d × h)	630 × 600 × 1500 mm

Airlock pumping system

Weight	17 kg
Dimensions (w × d × h)	300 × 300 × 340 mm

Control electronics

Weight	50 kg
Dimensions (w × d × h)	550 × 650 × 670 mm

Operation conditions

Temperature range	18 to 30 C
Relative humidity	up to 75%
Location	Indoor only
Maximum installation altitude	2000 m (above mean sea level)
Pollution degree	2
Overvoltage category	II

No cooling water for the microscope operation is required

