Tecnai™ Spirit TEM

Next generation microscopy for life sciences

The Tecnai™ Spirit TEM is an easy to use 20 kV to 120 kV transmission electron microscope (TEM) designed to provide high-contrast, high-resolution imaging and analysis in life science applications. Accelerating voltages ranging from 20 kV to 120 kV are ideal for light element biological matrices and provide the low voltage capability needed to minimize beam damage to delicate biological structures. Sophisticated automation allows the user to concentrate on scientific challenges rather than the details of operating the instrument. A series of embedded side-mount and bottom-mount CCD cameras provide instant, high-quality results at the push of a button. Available three-dimensional imaging software (Xplore*3D*™) automatically collects tomographic tilt series and reconstructs detailed three-dimensional models of intricate biological structures.

The high-performance vacuum system of the Tecnai Spirit TEM allows contamination-free cryo observation of frozen hydrated samples. Cryo techniques prepare and maintain samples in a fully hydrated, native state, avoiding the potential interferences and artifacts associated with harsh chemical and physical preparations. Low dose software ensures optimal image quality at the lowest possible radiation dose. Optional scanning mode (STEM) and energy dispersive X-ray analysis (EDX) permit elemental micro analysis with nanometer scale spatial resolution.

The Tecnai Spirit TEM is available in two lens configurations: the BioTWIN and the TWIN. The Tecnai Spirit BioTWIN TEM, specifically designed to maximize contrast in images of inherently low-contrast, native state, beam sensitive biological specimens, is well suited for exploring the 2D and 3D ultrastructure of cells and cell constituents. Samples can be stained or unstained and the lens design ensures maximum contrast, even at low magnifications. The Tecnai Spirit TWIN TEM is a general purpose, high-resolution configuration, designed for structural, chemical composition and function analysis of natural or artificial materials.

With its fast, convenient embedded automation, the Tecnai Spirit TEM automatically performs many routine operating procedures. It can automatically tune, align, saturate, and condition the gun and illumination, focus (or defocus) the image, and minimize astigmatism. Automation lowers the productivity threshold for novice users and helps ensure repeatable, high-quality results for all users.

Key benefits

- Easy enough for novice users in transmission electron microscopy
- Total solution for dual-axis tomography
- High level of automation
- Optimized for cryo electron microscopy
- Ergonomic design for operational comfort
- High contrast and high resolution for 20 kV to 120 kV operation
- Optimized for 2D and 3D imaging of cells, cell organelles and soft matter
- Sharp imaging of thick samples
- Smart tracking position system for sample navigation
- Outstanding analytical performance
- Customized protocols for diverse applications
- RAPID-enabled for remote service diagnostics

Essential Specifications

Objective lens	BioTWIN	TWIN
TEM Line resolution	0.34 nm	0.20 nm
TEM Magnification	22 x – 340 kx	18 x – 650 kx
STEM resolution	5 nm	1.0 nm
Focal length	6.1 mm	2.8 mm
Objective lens C_s	6.3 mm	2.2 mm
Objective lens C_c	5.0 mm	2.2 mm
Minimum focal step	9.0 nm	3.0 nm
SA camera length	0.05 m – 8.9 m	0.02 m – 4.2 m
EDX solid angle	0.35 str.	0.14 str.
Maximum eucentric tilt angle	± 80°	± 70°
Fixed cryo shields	standard (EDX compatible)	N/A
Cryo box	optional (not EDX compatible)	optional (not EDX compatible)

Electron source
- W or LaB_6 emitter
- Auto-saturation
- Auto-conditioning
- LaB_6 lifetime > 1 year
- Filament change < 5 min.
- High voltage range 20 kV to 120 kV, continuously variable
- High tension switching time < 1 min.

Illumination system
- Four lenses
- User selectable intensity limit for specimen protection
- User selectable intensity zoom for constant screen intensity
- HT stability ≤ 2 ppm/min
- Illumination modes micro/nanoprobe
- Eleven spot sizes
- One fixed C1 apertures
- Four exchangeable C2 apertures

Imaging
- TEM Information limit < 0.20 nm
- STEM magnification 150 – 3.1 Mx
- Four exchangeable objective apertures
- Five lens magnification system
- Automated contrast enhancement function
- Adjustable wobbler for all magnifications and directions
- Focus preset for focusing at eucentric position
- Rotation-free magnification and diffraction series
- Magnification aberration corrected lens series
- Embedded CCD camera*
- Plate camera with 56 sheets of film*

Micro analysis*
- Embedded EDX
- EDX detector resolution ≤ 135 eV
- EDX detector window SUTW
- No spurious/system peaks

CCD Camera
- Embedded control for all supported products: Gatan, SIS, Tietz, Eagle
- Automatic magnification calibration for double CCD cameras

Specimen stage
- Fully computer controlled, eucentric side entry, high stability CompuStage
- Maximum field of view
- Variety of specimen holders (cryo, multiple, rotation holders etc.)
- X, Y movement 2 mm, Z movement 0.75 mm, specimen size 3 mm
- Specimen position store and recall including optics setting, i.e., intensity, magnification, spotsizes
- Unlimited number of stored positions
- Minimum movement increments 0.5 µm (x, y) and 0.5° (tilt)
- Drift < 1 nm/min with standard holder
- Specimen exchange pumping time 10 sec. to 180 sec. (user adjustable)
- Specimen exchange time without switching off high tension and emitter < 30 sec
- STPS Smart Tracking Position System tracking interface for visualization of searching pathway incl. stored positions
- Intelligent recall comment mediated stage position recall

*optional

Vacuum
- Fully interlocked, differentially pumped column
- Ultra-high vacuum for contamination free observation of the specimen
- Plate camera exchange without switching off high tension and emitter
- Gun vacuum 1 x 10^{-6} Pa
- Column vacuum 1 x 10^{-5} Pa
- Oil-free air lock pumping
- Differential aperture 200 µm
- Pumping time for sample holder 10 sec. – 180 sec.
- Pumping time for (film) chamber 5 min
- Cold trap standard

Ergonomic Beckmann Binoculars
- Designed in close co-operation with Professor Beckmann and FEI TEM users
- Comfortable user-friendly working position reduces the overall body strain of the operator
- Significantly improved light transmittance and intensity compared to previous generation longer binoculars
- Excellent specifications for resolution, magnification, and field of view to get superb images

Xplore *3D* – 3D Imaging Software
- Total solution for dual-axis tomography
- Fully automatic tilt series acquisition
- 3D reconstruction
- Single and dual-axis reconstruction
- Volume rendering, segmentation, and visualization

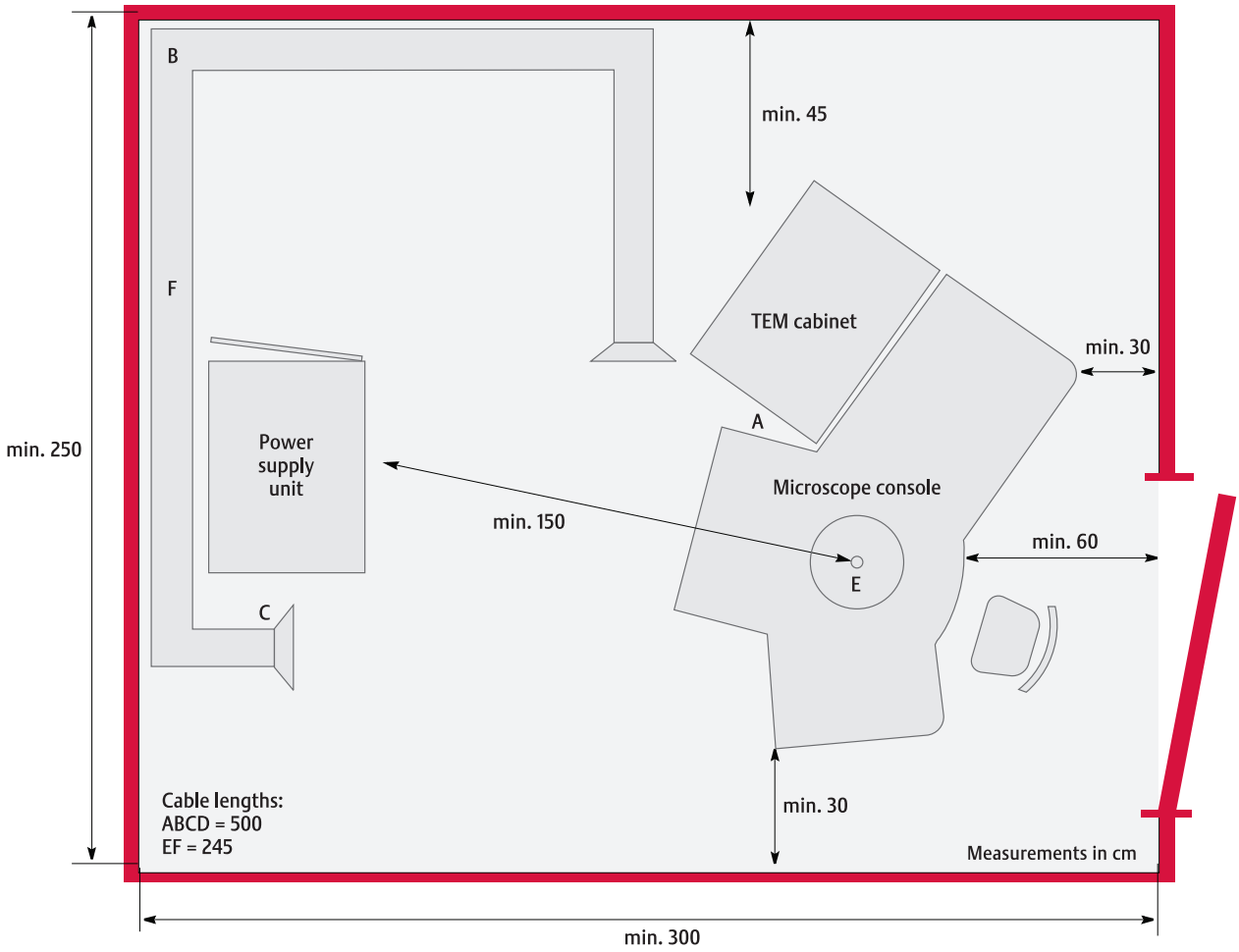
Operation/automation
- Operating system: *Windows*® XP
- User defined interface, three levels
- New ergonomic hand panels with joy-switch for stage movement and for beam-shift
- Remote operation Taro software*
- Scripting SW module*
- 2nd data monitor*
- Upgradeable functionality by uploading current and future application software solutions
- AutoGun module, enables automated gun conditioning, saturation, alignments
- One button direct light[1]
- AutoTune module, enables automatic focus and astigmatism correction
- STPS Smart Tracking Position System for interactive and navigational stage control
- Low dose software*

Training and support
- On-line help files – English, Japanese, Chinese
- Application instructions available
- Customer FEI Academy training Basic and Advanced Materials, Advanced Life Sciences, Advanced Cryo
- RAPID enabled for remote service diagnostics

*optional

1. Single push-button to switch on HT and filament, open column valves and have beam allow lowest SA magnification.

Preferred Room Layout with Minimum Dimensions



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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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