Transmission Electron Microscope

HT7700
Innovative transmission electron microscope optimized for the 21st century

TEM Controls consolidated on one monitor for streamlined observation and operation under ambient room light

**Viewing screen camera**
- Used for preliminary viewing of specimens. The image projected onto the fluorescent screen is displayed on the LCD monitor, eliminating the need to observe the fluorescent screen directly or through viewing binoculars.
- The high sensitivity camera makes it easy to view low intensity images projected onto the fluorescent screen.

**Main camera**
- Used for high resolution observation and image capturing. Image capture settings for the 1k × 1k or 2k × 2k camera can be adjusted in the main software control panel.
- Instrument parameters, specimen information and user-specified parameters are stored with the saved image to construct an image database.
- The ‘Quick save’ function saves sharp digital images with one click.

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Features
- TEM operation and viewing are integrated into one user interface, allowing for operation of the TEM in ambient room lighting.
- A high sensitivity digital screen camera allows for effortless viewing of samples even at ultra-low intensities on the LCD monitor.
- Hitachi’s unique Double-gap objective lens provides high contrast, high resolution, low magnification and wide field of view imaging modes.
- Hitachi’s proprietary stitching algorithm, included as a standard feature, provides high quality, seamless, panoramic imaging.
- Hitachi’s tomography software creates high-precision 3D reconstructions and corrects for missing wedges. (optional)
- Turbo molecular vacuum system provides a clean vacuum system. This evacuation system consumes less energy and provides a 30% reduction in CO2 emissions, making the HT7700 a green, eco-friendly instrument. (comparison H-7650, production in 2004)

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The HT7700 is a highly advanced Transmission Electron Microscope developed for imaging both biological and nano-material specimens. A unique Hitachi Double-gap objective lens design combines extremely high contrast and high resolution imaging modes in one system. The ergonomic design of this state-of-the-art TEM places the control panel and LCD monitor in one location separate from the column, providing user-friendly operation of the TEM. A high sensitivity digital screen camera replaces the binoculars for low magnification sample scanning under ambient lighting conditions.
Hitachi’s unique Double-gap objective lens provides two high quality imaging modes over a wide range of magnifications.

**HC mode (long focal length lens)**
- A mini-objective lens is excited at the same polarity as the main objective lens, producing a strong magnetic field.
- The main lens and mini-lens are used in conjunction to produce a long focal length for high contrast imaging.

**HR mode (short focal length lens)**
- The mini-objective lens is operated at a reverse polarity to the main objective lens, producing no magnetic field.
- The main lens and mini-lens are used in conjunction to produce a short focal length for high resolution imaging.

Auto multiple frame function captures seamless panoramic images with pushbutton ease.

- High-precision and wide-frame panoramic images can be produced by moving the specimen stage or by means of image shift.
- Produce montage images with a maximum of 8 k x 8 k pixels.
- Position and relational information is automatically stored with each image, allowing for high precision alignment during the stitching process.

Specimen: Anthophyllite
Accelerating voltage: 120kV

High Contrast observation
Low magnification observation

Specimen: Synthetic magnetic lens
Magnetic field distribution
HC mode (Long focal length)
Double-gap objective lens
High Contrast observation
Low magnification observation

Specimen: Mouse cerebral cortex (4×4, using 2k camera), courtesy by Dr. Yasuo UCHIYAMA, Juntendo University School of Medicine
Direct magnification: 10,000×, Accelerating voltage: 80kV

Hitachi’s unique lens design provides both long and short focal length settings for high contrast or high resolution imaging.

The long focal length setting is for low magnification and high contrast (HC) imaging. The short focal length setting is for high magnification and high resolution (HR) imaging. These two imaging modes are available instantly at the touch of a button.

High-precision and wide-frame panoramic images can be produced by moving the specimen stage or by means of image shift.

Produce montage images with a maximum of 8 k x 8 k pixels.

Position and relational information is automatically stored with each image, allowing for high precision alignment during the stitching process.

Auto multiple frame function captures seamless panoramic images with pushbutton ease.

- High-precision and wide-frame panoramic images can be produced by moving the specimen stage or by means of image shift.
- Produce montage images with a maximum of 8 k x 8 k pixels.
- Position and relational information is automatically stored with each image, allowing for high precision alignment during the stitching process.
Auto drive mode allows display of specific areas of interest quickly

All saved images are stored in an image database and the thumbnail of the image can be viewed. Each thumbnail image contains the microscope setting when the image was captured. When the operator clicks any one of the thumbnail and selects the auto-drive mode, the instrument drives the specimen stage to the corresponding position where the image was captured.

Image navigation

Image navigation allows the storage of up to 100 stage coordinate positions and tilt angles. When a saved location is recalled, the instrument drives the specimen stage to the saved coordinate position and tilt angle. The micro-trace mode stores the movement of the stage and displays the history of stage movements for easy recognition of viewed and unviewed areas of the specimen.

Electron tomography (optional)

With electron tomography, the missing wedge due to restrictions on specimen tilt limits resolution in the Z-axis. The combination of Double-axis tomography and Hitachi's unique reconstruction algorithm achieves 3D reconstruction with fewer artifacts from missing data than before, without placing fiducials on the specimen.

Reconstruction image of 3D model

Reconstructed by SIRT

Essential specifications

- **Resolution**:
  - 3.0 nm (100 kV)
  - ×200 ~ ×200,000 (HC mode)
  - ×4,000 ~ ×60,000,000 (HR mode)
  - (Non-rotating zoom system)
- **Magnification**:
  - LOW MAG: x50 ~ x1,000

- **Accelerating voltage**:
  - 40 ~ 120 kV (100 V/step variable)

- **Field rotation**:
  - x15°, +45°, -45°
  - 15° step

- **Stage traverse**:
  - X, Y: ±1 mm, Z: ±0.5 mm

- **Maximum tilt**:
  - ±30° (standard), ±70° (optional)

- **Digital CCD camera**:
  - No. of pixels: 1,024 x 1,024 (pixels) or 2,048 x 2,048 (pixels)

- **Standard features**:
  - Auto-focus
  - Autofocus
  - Microscope
  - Autofocus
  - Autofocus
  - Auto-gain alignment
  - Live FFT display

- **Measurement function**:
  - Manual / automatic measurement function
  - Live display
  - APS (auto pre-irradiation system)
  - Scope unit with mild baking function

- **Power**:
  - Single phase AC 100, 115, 200, 220, 240 V / 50/60 Hz, 4.0 kVA

- **Voltage stability**:
  - ±10% or better

- **Grounding**:
  - Independent grounding with a resistance of 100Ω or better

- **Cooling water**:
  - Temperature: 15 to 23°C (Stability at ±0.1°C (for 30 minutes)
  - Flow: 1.8 to 2.2 Liter/min
  - Pressure: Approx. 0.05 to 0.15 MPa
  - Inlet: Rc 3/8 (female) ×1
  - Drain: Rc 3/8 (female) ×1
  - Noise: 1.5 × 10⁻⁷ T or less

- **Stray magnetic field**:
  - Frequency: 5Hz or lower
  - Amplitude: 0.4μmp-p or less
  - Frequency: 5Hz or higher
  - Amplitude: 1μmp-p or less

- **Room**:
  - Temperature: 15 to 25°C
  - Humidity: 30 to 60%RH

Optional accessories

- 3D tilted image acquisition function
- 3D reconstruction software
- EDX system
- LaB6 filament
- Variable aperture for restricted field of view etc.

Optional specimen holders

- One Touch Single Tilt Holder
- One Touch Three Specimen Holder
- Rotation Holder
- Double Tilt Holder
- Powder Heating Holder
- Three Specimen Holder

Installation site conditions

- **Power**:
  - Single phase AC 100, 115, 200, 220, 240 V / 50/60 Hz, 4.0 kVA

- **Voltage stability**:
  - ±10% or better

- **Independent grounding**:
  - With a resistance of 100Ω or better

- **Cooling water**:
  - Temperature: 15 to 20°C (Stability at ±0.1°C (for 30 minutes)
  - Flow: 1.8 to 2.2 Liter/min
  - Pressure: Approx. 0.05 to 0.15 MPa
  - Inlet: Rc 3/8 (female) ×1
  - Drain: Rc 3/8 (female) ×1

- **Noise**:
  - Frequency: 5Hz or lower
  - Amplitude: 0.4μmp-p or less
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  - Amplitude: 1μmp-p or less

- **Room**:
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Suggested floor plan

- **Rotary pump**
- **High-voltage transformer**
- **Air compressor**
- **X-ray Analysis Holder**
- **Scope unit with mild baking function**

- **Height of condenser lens aperture**: Approx. 140 cm
- **Height of specimen holder and objective lens aperture**: Approx. 130 cm

- **3D tilted image acquisition function**
- **3D reconstruction software**
- **EDX system**
- **LaB6 filament**
- **Variable aperture for restricted field of view etc.**