https://www.hitachi-hightech.com/global/science/products/microscopes/electron-microscope/tabletop-microscopes/tm4000.html

TM4000Plus/TM4000 Specifications

■Specifications

Item	TM4000Plus	TM4000
Magnifications p. 4.	×10 - ×100,000 (Photographic magnification*1) ×25 - ×250,000 (Monitor display magnification*2)	
Accelerating voltage	5 kV、10 kV、15 kV p. 5.	
Image signal p. 7. p. 7.2.	Backscattered electron Secondary electron Mix(Backscattered electron+ Secondary electron)	Backscattered electron
Vacuum mode	BSE: Conductor/Standard/ Charge-up reduction SE: Standard/ Charge-up reduction Mix: Standard/ Charge-up reduction	BSE: Standard/ Chaege-up reduction
Image mode (BSE)	Normal/Shadow 1/Shadow 2/TOPO	
Sample stage traverse p. 12.	X: 40 mm, Y: 35 mm p. 12.2.	
Maximum sample size	80 mm (diameter), 50 mm (thickness) p. 11.1., 11.2.	
Electron gun	Pre-centered cartridge tungsten filament p. 3.	
Signal detection system p. 6. p. 6.1. p. 6.2.	High-Sensitivity 4-segment BSE detector High-Sensitivity Low-Vacuum SE detector (UVD)	High-Sensitivity 4-segment BSE detector
Auto image-adjustment function p. 14.	Auto start, Auto focus, Auto brightness p. 14.1., p. 14.2., p.14.3.	
image data saving p. 15.1.	2,560 × 1,920 pixels, 1,280 × 960 pixels, 640 × 480 pixels	
Image format	BMP、TIFF、JPEG p. 15.2.	
Data display	Micron marker, micron value, magnification, date and time, image number and comment, WD (Working Distance), accelerating voltage, vacuum mode, image signal, image mode	
Evacuation system (vacuum pump) p. 8.	Turbo molecular pump: 67 L/s x 1 unit Diaphragm pump: 20 L/min x 1 unit p. 8.2.	
Operation help functions	Raster rotation, Magnification presets (3 steps), Image shift (±50 μm @ WD6.0 mm) p. 13.	
Safety functions	Over-current protection function, built-in ELCB	

■Required PC and monitor specifications p. 19.

Item	Specifications
OS	Windows® 10 (64bit) p. 19.2.
CPU	Intel®processor, Number of cores:4, Clocl Speed:3.0 GHz(equivalent or higher)
Memory device	HDD, DVD-ROM Drive
Display resolution	1,920 × 1,080 pixels

■Size/weight

Item	Description
Main unit (motorized stage) p. 12.1.	330 (width) × 614 (depth) × 547 (height), 52kg
Main unit (manual stage)	330 (width) × 617 (depth) × 547 (height), 52kg
Diaphragm pump	144 (width) × 270 (depth) × 216 (height), 5.5kg

■Optional accessories

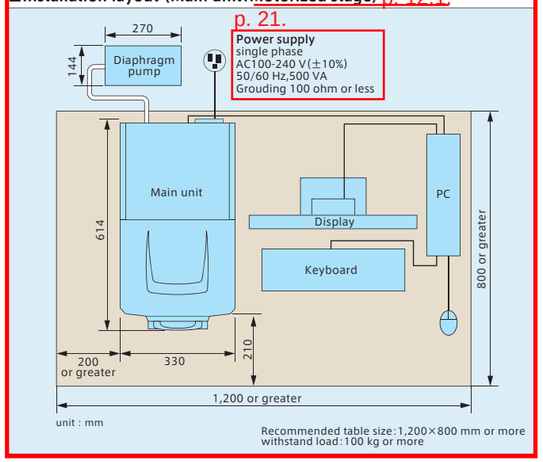
Camera navigation system
Energy Dispersive X-ray Spectrometer (EDS)
Three-dimensional image display/measurement function Hitachi map 3D

■Installation conditions p. 2.

Item	Description
Room temperature	15-30 ℃ (△t=within ±2.5℃/h or less)
Humidity	- 70% RH (no condensation)
Power supply (main unit)	Singlep hase AC100-240 V (fluctuations in voltage: ±10%)

*Another power souce for PC is required. p. 20.

■Installation layout (Main unit: Motorized stage) p. 12.1.



*1 Defined at photo size of 127 mm×95 mm (4"×5" picture size)
*2 Defined at display size of 317 mm×238 mm
*Please make room for more than 200 mm to the left side of a main unit and put it the closest to the center position of the table.
*A table with caster is not suitable to put a main unit of TM4000 Series on.
*Please put a diaphragm pump under the table.
*Periodical maintenance is required for this apparatus.
*Powercables, earth terminal and table should be prepared by users.
*TM4000 Series is not approved as a medical device.
*Dedicated mentors, teachers who received the operation training of the instrument are required at compulsory schools.
*It is advisable not to install or relocate the instrument by yourselves.
*When relocating the system, please contact in advance the sales department that handles your account or a maintenance service company designated by Hitachi.
*Screen shows simulated image.
*Windows® is a resistered trademark of U.S.Microsoft Corp. in U.S.A. and other countries.
*Intel® is a resistered trademark of Intel Corp. or its affilated companies in the United States and/or other countries.

Science for a better tomorrow

*This logo is the trademark of Hitachi High-Technologies Corporation throughout the world.

Notice: For correct operation, follow the instruction manual when using the instrument.

Specifications in this catalog are subject to change with or without notice, as Hitachi High-Technologies Corporation continues to develop the latest technologies and products for our customers.

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Tokyo, Japan
http://www.hitachi-hitec.com/global/em/
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For technical consultation before purchase, please contact:contact@nst.hitachi-hitec.com

HTD-E249 2017.8

Hitachi Tabletop Microscope
TM4000/TM4000Plus

HITACHI
Inspire the Next

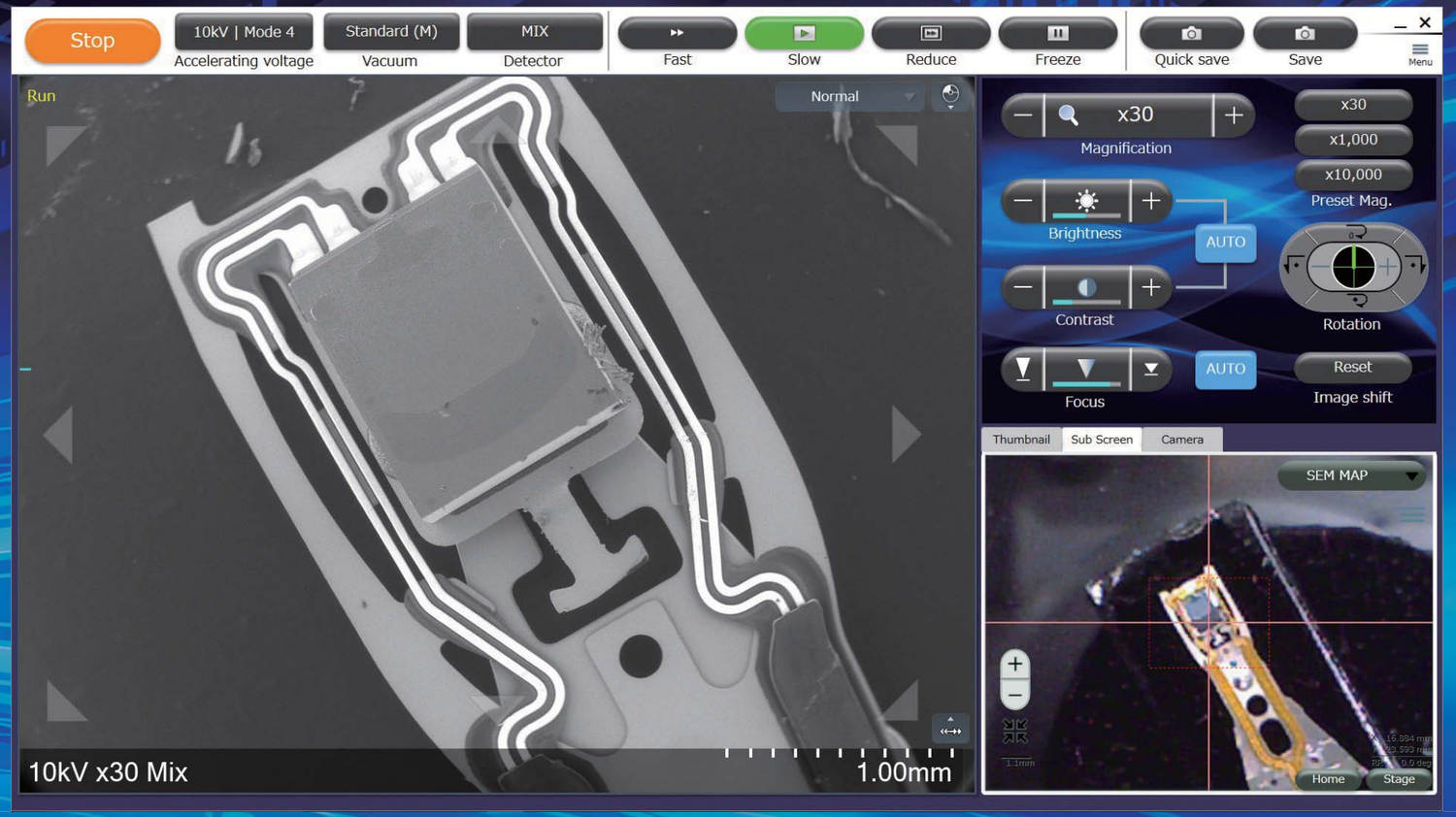
WE STAND BY YOU.

Tabletop Microscope

TM4000 Series

The Future of Tabletop Microscopes is Here!

The TM4000 Series features innovation and cutting-edge technologies which redefine the capabilities of a tabletop microscope. This new generation of the long-standing Hitachi tabletop microscopes™ integrates ease of use, optimized imaging, and high image quality, while maintaining the compact design of the well-established Hitachi TM Series products. Experience the new dimension of tabletop microscopes with the Hitachi TM4000 and TM4000Plus.



1 Easy and intuitive operation for data acquisition, reporting, and everything in between.

2 Cutting-edge electron optics for high-image resolution and quality.

3 Compact and efficient design allows installation almost anywhere.

p. 2. (https://www.hitachi-hightech.com/global/science/products/microscopes/electron-microscope/tabletop-microscopes/tm4000.html)
p. 20.

*Screen include a image processed by option.

Quick and Easy

Observe samples and acquire images in just mi nutes! Collect data and generate reports quickly and effectively.

The TM4000 Series provides a solution for SEM users to easily obtain high-quality data and quickly generate reports for a very efficient workflow. Sample sizes of up to 80 mm (diameter) and 50 mm (thickness) can be accomodated. Environmentally friendly and efficient vacuum system allows for short pump-down times and high sample throughput.

p. 1. (https://www.hitachi-hightech.com/global/science/products/microscopes/electron-microscope/tabletop-microscopes/tm4000.html)

Miniscope®

Data collection to report generation

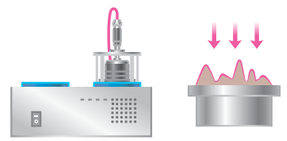
1 Mount sample on stage

Sample:Watch

p. 10.

No need to sputter coat or use vapor deposition

In typical systems, this would be required for analysis of non-conductive materials



2 Initiate observation

1 Start Click the start button

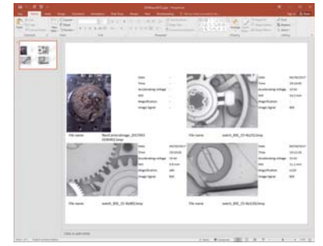
2 Auto start procedure is activated

3 Image displayed at low magnificaiton for easy and quick navigation

Sample:Watch

Start to finish in just under 3 minutes

Generate reports easily with "Report Creator"



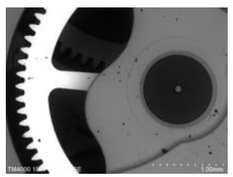
Simply select images and a template to generate customized reports

Automation, Observation, and Elemental Analysis

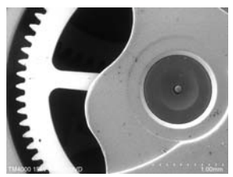
Imaging switch with just and click

Automatically collect multiple data types with a single click!

Backscattered electron image
(compositional information)



Secondary electron image
(surface morphology)*

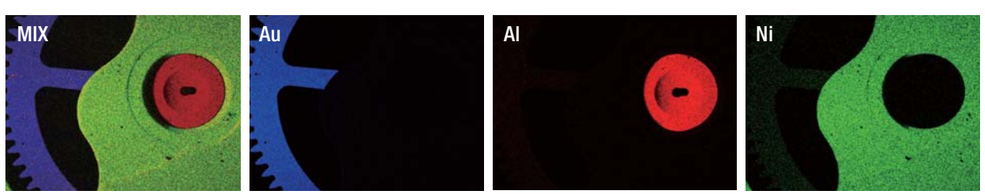


Mixed images
(backscattered electron images +secondary electron images)

Sample:Watch

Elemental analysis

Rapid acquisition of element maps



Sample:Watch

Easy operation with use of Camera Navi.*

Easy operation

Optical image helps you navigate to the region of interest and supports observation with the MAP function

*Optional

p. 9. (https://www.hitachi-hightech.com/global/science/products/microscopes/electron-microscope/tabletop-microscopes/tm4000.html)

Easy Maintenance

Easy maintenance

Equipped with oil free vacuum pump and replaceable cartridge filament.

Equipped with diaphragm pumps that need no oil.

Pre-centered cartridge filament makes it simple to replace.

*The secondary electron image can only be observed in TM4000Plus.

TM4000 Series — Highly versitile design

The TM4000 Series gives users the freedom to optimize various operating conditions including beam condition (accelerating voltage), acquired electron signal type, magnification, and more.

5 kV Accelerating voltage

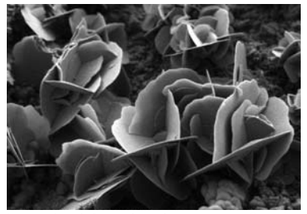


Image signal: Secondary electron
Magnification: 3,000x
Sample: Copper crystals

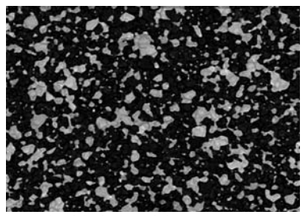


Image signal: Backscattered electron
Magnification: 10,000x
Sample: Magnetic head

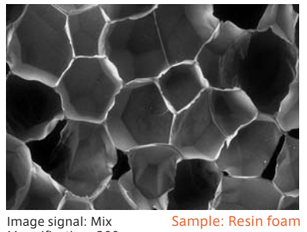


Image signal: Mix
Magnification: 200x
Sample: Resin foam

10 kV Accelerating voltage

Image signal: Mix
Magnification: 7,000x
Sample: Rat bronchus

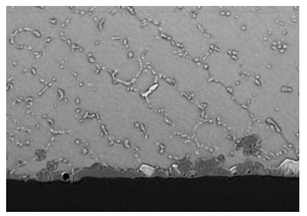


Image signal: Backscattered electron
Magnification: 10,000x
Sample: Ball grid array (BGA)

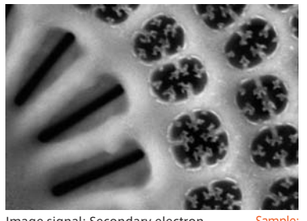


Image signal: Secondary electron
Magnification: 10,000x
Sample: Bacillariophyta

15 kV Accelerating voltage

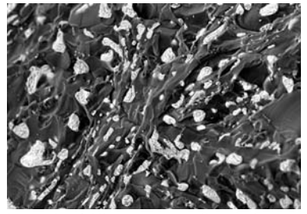


Image signal: Mix
Magnification: 500x
Sample: Ceramic

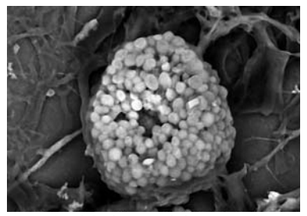


Image signal: Backscattered electron
Magnification: 15,000x
Sample: Mast cell

Image signal: Mix
Magnification: 25x
Sample:Honey bee

p. 6.3. (https://www.hitachi-hightech.com/global/science/products/microscopes/electron-microscope/tabletop-microscopes/tm4000.html)

p. 10. Accelerating Voltage

The TM4000 Series features three beam conditions to chose from depending on the information desired from the sample. Differences in image appearance by changing accelerating voltage to 5 kV, 10 kV, and 15 kV are shown below."

Accelerating Voltage	5 kV	10 kV	15 kV
Resolution	Low	⟷	high
Image information	Surface	⟷	internal
Backscattered electron signal	Low	⟷	High

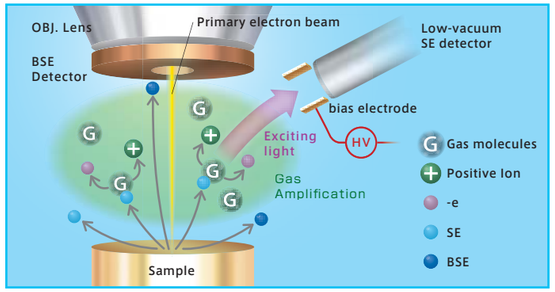
TM4000Plus

The TM4000Plus advances the EM field with the unmatched ability to observe SE,BSE, and mixed images under low vacuum conditions.

The Superior High-Sensitivity Low-Vacuum SE Detector (TM4000Plus)

The TM4000Plus equips the high-sensitivity low-vacuum SE detector.
Therefore, an image of SE information is possible to obtain due to detecting the excited light.

Principle



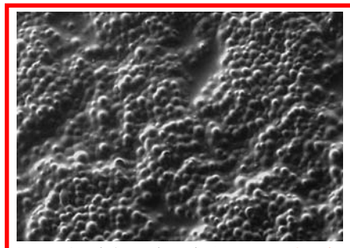


Image signal: Secondary electron
Magnification: 1,000x
Sample: Factional film

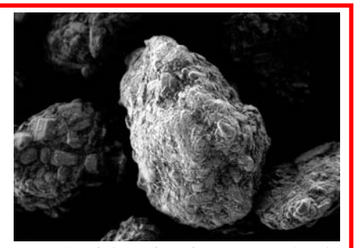
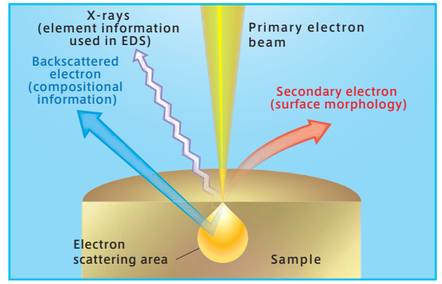


Image signal: Secondary electron
Magnification: 3,000x
Sample: Powder medicine

p. 1.

Detection Signals

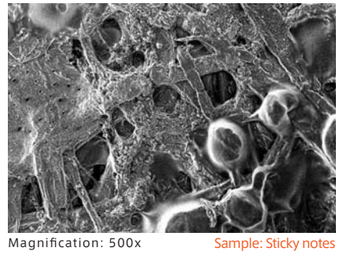
It is possible to observe multiple signals in TM4000 Series.
Backscattered electron image (BSE)
: Provides compositional information
Secondary electron image (SE)
: Provides surface rich information In typical instruments, the secondary electron image can only be acquired under high-vacuum conditions but with the TM4000Plus, the observation of SE information under low vacuum is easily achieved.



BSE

Magnification: 500x

SE



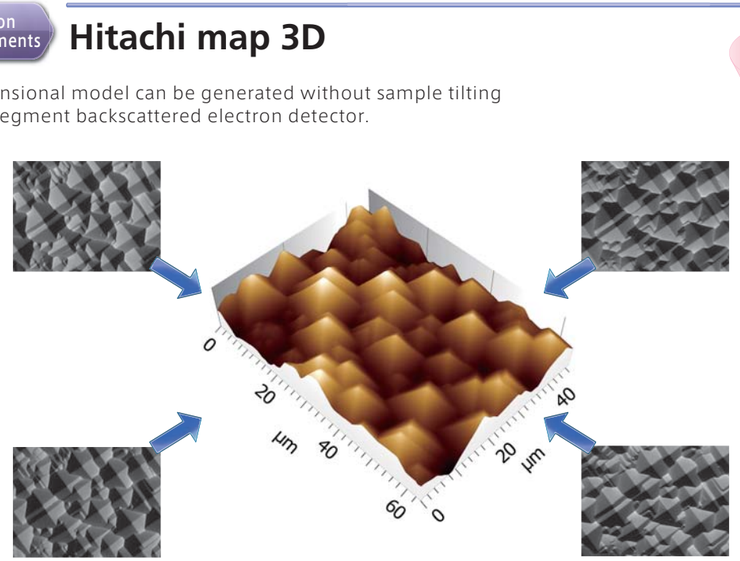
Magnification: 500x
Sample: Sticky notes

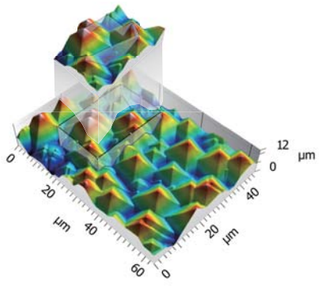
Three-dimensional models allow height measurements

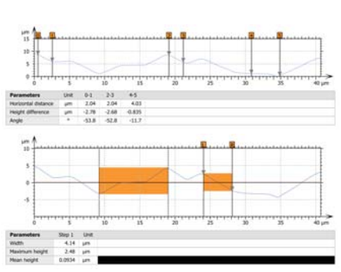
3D construction and measurements

Hitachi map 3D

A 3-dimensional model can be generated without sample tilting using 4-segment backscattered electron detector.







Hitachi map 3D software overview

specification

■ Hitachi map 3D functions

Item	Description
Import function	Automatic select and read function of four-elements image data
Measurement performance	Depth accuracy less than ±20% (reference) Measurement performance varies depending on calibration accuracy, the condition/type of specimen, the observation mode, and the observation condition. Detectable angle range ±50° (reference)
Measurement function	Section profile display extracted between any points on the three-dimensional image Distance of X and Y, length and angle measurements between two points, Surface area and Volume Distance of X,Y and Z, length and many other measurements between 2 points specified on section profile Simple profile roughness and surface roughness measurement Baseline offset (straight, curve), leveling and multiple offset Cutting surface, Color contour line, Bird's-eye view and pseudo color display Layout, Template and image composition from multiple images functions
Three-dimensional display function	Rotation, zoom-in and multiple rendering process Animation record function of observation screen
Output function	Report, Image: RDF, RTF, PNG, JPG, GIF, TIF, BMP, EMF Three-dimension image/movie: SUR, 3MF, STL, WRL, TXT, X3D/WMV, AVI

■ PC installation requirements

Item	Description
Windows versions	Windows® 7, 8, .x 10 (x64 or x32)
Processor	Quadcore processor
RAM memory	8 GB or more
Graphic board	Open GL 2.0 or Direct 3D 9.0c
HDD free space	800 MB or more
Other	1 free USB port

Windows® is a resistered trademark of U.S.Microsoft Corp. in U.S.A. and other countries.

Simple operation and large detection area enables high-speed data acquisition.

The TM4000 Series offers multiple EDS systems to choose from based on application and budget. Two classes of detectors are available: a low-cost 10-mm² detector and a large-sized 30-mm² detector, both of which are compact design and do not require LN2.

Simple, intuitive operation

Quantax 75

Detection area: 30 mm²

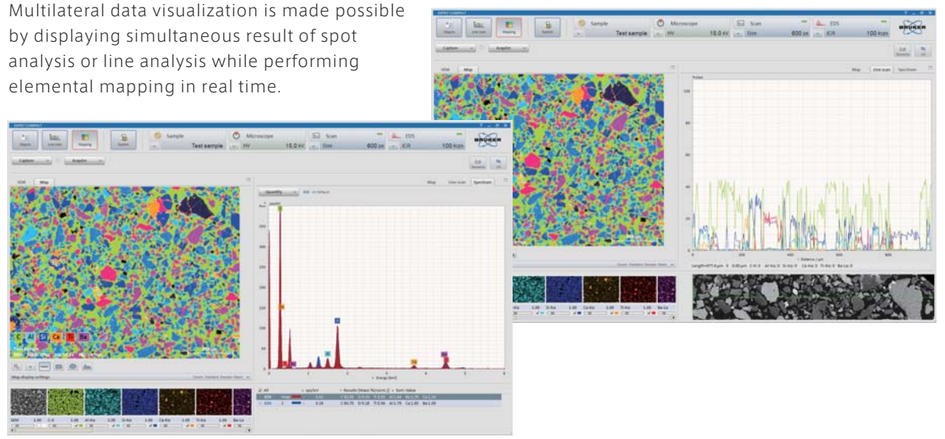
- High-speed colorized X-ray mapping with easy operation.
- Local spectra observation at specified locations made simple.
- Hypermap function for spot analysis, line analysis, and mapping results in a single acquisition.

Sample configuration in combination with a TM4000 series instrument

＊Screen shows simulated image

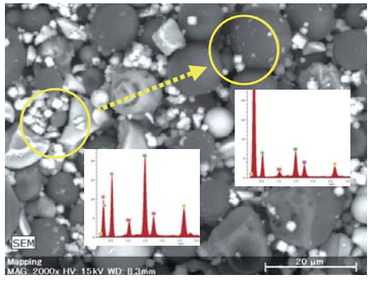
Dual mode display

Multilateral data visualization is made possible by displaying simultaneous result of spot analysis or line analysis while performing elemental mapping in real time.



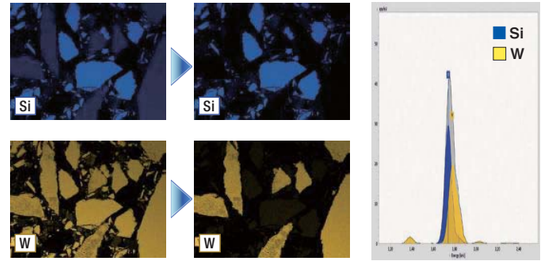
Spot analysis

Spectrum displayed in real time, allowing easy visualization of elemental composition for a targeted ROI.



Live deconvolution to separate overlapping elements

Allows spectra with overlapping peaks to be separated and visually mapped in real time.



Simple operation and large detection area enables high-speed data acquisition.

Aztec series

- Icons arranged in order of procedural flow make operation easy.
- Spectrum-fitting functionality allows easy observation of element superposition.
- The TruMap feature allows elements with overlapping peaks to be properly separated and displayed (AZtecOne).

Sample configuration in combination with a TM4000 series instrument

＊Screen shows simulated image

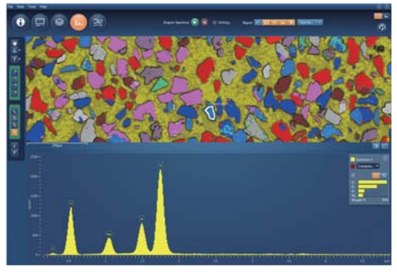
Basic

AZtecOneGO

Detection area: 10 mm²

Example of mapping analysis

In addition to standard spectrum acquisition, the system allows spectra for user-specified regions to be reconstructed from mapping data. The selected region may be defined as a point, rectangle, ellipse, or region bound by a user-drawn freehand curve.



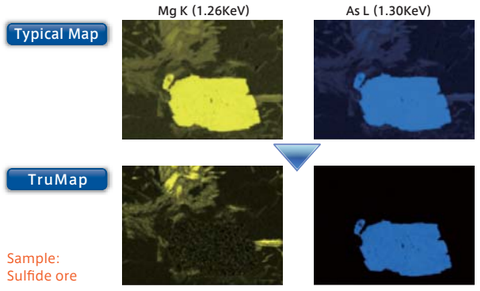
Advanced

AZtecOne

Detection area: 30 mm²

High-precision and multifaceted TruMap function

The TruMap feature allows multi-element spectra to be properly separated and background subtracted in real time, resulting in a precise elemental map with no image contamination due to overlapping peaks.



Multi-featured analysis

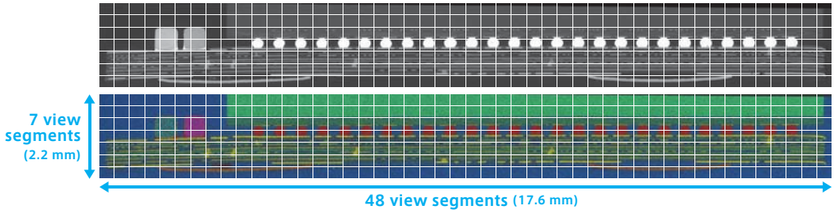
AZtec Energy Miniscope Edition

Detection area: 30 mm²

The AZtec Energy system offers advanced analytical functionality and flexible configurations with ability to automate analysis via a monitorized stage. The Aztec Energy enables wide-area mapping and particle analysis

Wide-area mapping option: AZtec Large Area Mapping

The Aztec Mapping software automatically acquires data for multiple specified regions to produce a single combined set of mapping information.



Magnification: 400× per view segment

Sample: Cross section of resin case for electronic component

https://www.hitachi-hightech.com/global/science/products/microscopes/electron-microscope/tabletop-microscopes/aztec/

Quantax75 specification (Made by Oxford Instruments (UK))

■ **Detector**

Item	Description
Detector type	Silicon drift detector (SDD)
Detector area	30 mm²
Energy resolution	148 eV (Cu-Kα) (Mn-Kα: equivalent of 129 eV or less)
Detection element	B_5～Cf_{98}
Cooling method	2-stage thermoelectric (peltier) cooling (without fan and LN_2 free)
Energy channel	4,096 channel (2.5 eV/ch at minimum)

■ **Software**

Item	Description
Qualitative analysis	Auto / manual
Quantitative analysis	Standardless quantitative analysis, normalized to 100%
Analysis mode	Object mode (including point, rectangle, ellipse and polygon) Line scan Hypermap (mapping, spot analysis, line analysis)
Element mapping	Maximum map image resolution 1,600x1,200 Rainbow map Online deconvolution
Report preparation features	Templates for printing may be prepared PDF、Microsoft® Word、Excel

■ **Size/weight**

Item	Description
Detector	100(width) × 45(depth) ×120(height) mm, 1.45 kg

■ **Installation conditions**

Item	Description
Power supply	Single-phase AC, 100/240 V 50/60 Hz

AZtecOne specification p. 16. (Made by Oxford Instruments (UK))

■ **Detector** p. 17

Item	AZtecOne	AZtecOneGO
Detector type	Silicon drift detector (SDD)	
Detection area	30 mm² p. 17.1.	10 mm²
Energy resolution	158 eV (Cu-Kα) (Mn-Kα: equivalent of 137 eV)	151 eV (Cu-Kα) (Mn-Kα: equivalent of 129 eV)
Detection element	B_5～U_{92} p. 17.3.	
Thermal cycle	Detector cool down on demand	
Cooling method	2-stage thermoelectric Cooling (without fan and LN2 free) p. 17.2.	

■ **Software** p. 18.

Item	AZtecOne	AZtecOneGO
Spectrum display	Scaling display in horizontal and vertical directions; KLM markers displayed	
Qualitative analysis	Auto / manual	
Quantitative analysis	Standardless quantitative analysis, normalized to 100%	
Image acquisition	2,048×1,536、1,024×768、512×384	1,024×768、512×384
Element mapping p. 18.1. p. 18.2.	Resolution: select from 1,024,512, 256, or 128 pixels	Resolution: select from 256, or 128 pixels
	Detectable elements: Up to 80 elements	
	MixMap: 7 or more	
Line scan p. 18.1.	Arbitrary line positions and directions may be specified; the color of line displays for each element may be changed Lines may be superposed on scanning images; line-scan spectrum displays	
Point & ID (Beam control) p. 18.1.	Number of points that may be selected: over 1,000 Rectangular, elliptical, or freehand-drawn regions of arbitrary sizes may be specified	
TruMap	Yes	No
Assistance	Operating guide functionality	
Data management	Managed separately for each project	
Report preparation features	Templates for printing may be prepared. Can produce printed versions of spectra, data-acquisition conditions, comments, and other content Spectra may be exported to BMP, TIFF, JPEG, text formats Reports in Microsoft® Word 2013 format may be exported	

■ **Size/weight**

Item	Description
Detector	145 (width) × 150 (depth) × 200 (height) mm, 2.7 kg
Analyzer unit	290 (width) × 260 (depth) × 330 (height) mm, 10 kg

■ **Installation conditions**

Item	Description
Power supply (AZtecOne)	Single-phase AC, 100-240 V, 50/60 Hz, 400 VA

AZtecEnergy specification for TM3030 series (Made by Oxford Instruments (UK))

■ **Detector**

Item	Description
Detector type	Silicon drift detector (SDD)
Detection area	30 mm²
Energy resolution	158 eV (Cu-Kα) (Mn-Kα: equivalent of 137 eV)
Detection element	B_5～U_{92}
Thermal cycle	Detector cool down on demand
Cooling method	2-stage thermoelectric (peltier) cooling (without fan and LN2 free)

■ **Size/weight**

Item	Description
Detector	145 (width) × 150(depth) × 200 (height) mm, 2.7 kg
Analyzer unit	290 (width) × 260 (depth) × 330 (height) mm, 1.0 kg

■ **Software**

Item	Description
Spectrum display	Scaling display in horizontal and vertical directions; KLM markers displayed
Qualitative analysis	Auto / manual
Quantitative analysis	Standardless quantitative analysis, normalized to 100%
Image acquisition	64-8,192 pixels
Element mapping	Resolution: 64-4,096 pixels Number of detectable elements: Up to 80 MixMap: 7 or more possible
Line scan	Arbitrary line positions and directions may be specified; the color of line displays for each element may be changed Lines may be superposed on scanning images; line-scan spectrum displays
Point & ID (Beam control)	Number of points that may be selected: over 1,000 Rectangular, elliptical, or freehand-drawn regions of arbitrary sizes may be specified
Report preparation features	Templates for printing may be prepared. Can produce printed versions of spectra, data-acquisition conditions, comments, and other content Spectra may be exported to BMP, TIFF, JPEG, text formats Reports in Microsoft® Word 2013 format may be exported
Options	TruMap (TruLine), AZtec Large Area Mapping, AZtec Feature, etc,

＊ For more information, please contact your Hitachi vendor.

■ **Installation conditions**

Item	Description
Power supply (AZtecEnergy)	Single-phase AC, 100-240 V, 50/60 Hz, 1.5 kVA