Superior

Exciting Service
sec
e-beam pioneer

& Challenge!

sec
e-beam pioneer

Russia

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S canning **E** lectron

TABLETOP
SEM
The Ultimate Solution

M icroscopy

sec
e-beam pioneer

SEC Co.,Ltd. has been developing and selling equipment for inspection & analysis machine for over 20years. Since establishment in 1991, we have been continually developing the highest quality of e-beam inspection equipment in Korea.

With the ability to locally source all components and constantly developing new technologies, SEC has distinguished itself amongst the global competition. With the ability to adapt to changes in technology, SEC offers products that can satisfy the customers needs.

Superior Service & Exciting Challenge!
Be the **Best!** Follow the right **Path!** Keep the **Faith!**

e – beam pioneer
A corporation specialized in E-beam Technology, leading the nano era

"Speedy Entertaining Microscope"

SEC has succeeded to minimize the module of normal SEM, our compact designed Tabletop SEM has sold over 600 units since its launch in 2006.

SEC's Tabletop SEM is very easy to use even for non-expert users. Also it has advantage of fast analysis, short time vacuuming, high quality image with simple operation.

History

10 Million Dollars of
Tower of Export Awarded

2017~
Launch of new models with lower price and ease-of- use functions

2012~2016
High resolution SNE-4500M(2012)
Attains total sales of 500 SEM Systems
& 1,000 X-ray Inspection System(2016)

2009~2012
100 Total Units Sold(2009)
Wins of Excellence Award Innovative Technology Fair

2006~
Development Tabletop SEM

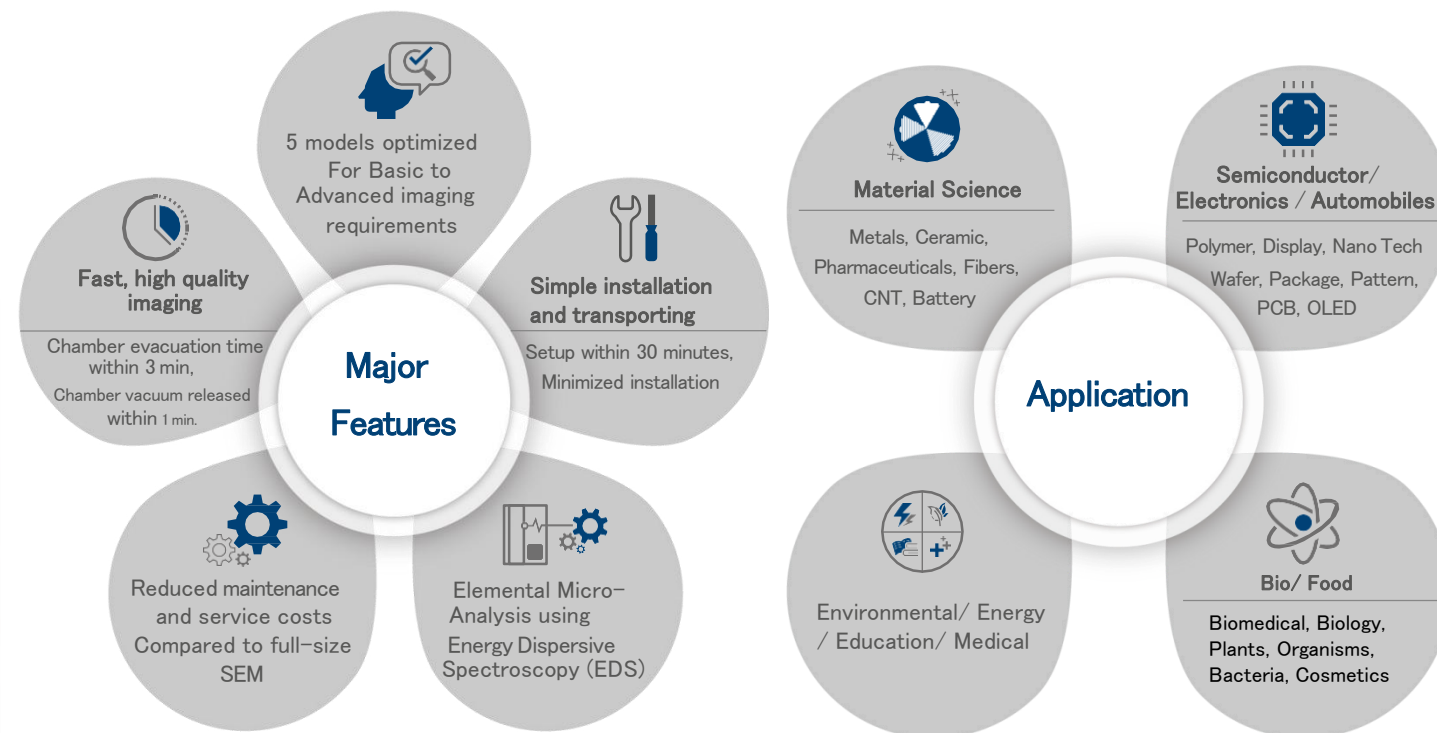**2000~2005**
Development X-ray Inspection System

1991~1999
SEC Engineering Establishment

SCANNING ELECTRON
MICROSCOPY

SNE-4500Plus   SNE-4500M   SNE-3200M   SNE-3000MS

What is Tabletop-SEM?

Major Features

5 models optimized For Basic to Advanced imaging requirements

Simple installation and transporting
Setup within 30 minutes, Minimized installation

Fast, high quality imaging
Chamber evacuation time within 3 min,
Chamber vacuum released within 1 min.

Reduced maintenance and service costs Compared to full-size SEM

Elemental Micro-Analysis using Energy Dispersive Spectroscopy (EDS)

Application

Material Science
Metals, Ceramic, Pharmaceuticals, Fibers, CNT, Battery

Semiconductor/ Electronics / Automobiles
Polymer, Display, Nano Tech Wafer, Package, Pattern, PCB, OLED

Environmental/ Energy / Education/ Medical

Bio/ Food
Biomedical, Biology, Plants, Organisms, Bacteria, Cosmetics

Performance

Model	SNE-4500M Plus(A)	SNE-4500M Plus(B)	SNE-4500M	SNE-3000MS	SNE-3200M
Resolution	5nm			15nm	
Magnification	150,000x		100,000x	60,000x	
Detector	SE	SE/BSE		SE	SE/BSE
Vacuum	High	High/Low		High	High/Low
Stage	X, Y, R, Z, T : Fully Motorized		X, Y, R, Z, T : Manual		X, Y, R : Manual

Specifications

|			
Stage Traverse	X,Y: 40mm Z: 0~40mm R: 360° T: -45~90°	X,Y: 40mm Z: 0~35mm R: 360° T: 0~45°	X,Y: 35mm R: 360°
Max. Sample Size	80mm(D) / 50mm(H)	80mm(D) / 35mm(H)	70mm(D) / 30mm(H)
Camera	Top-View Camera	–	–
O.L Aperture Type	30, 50, 50, 100μm(Variable Type)		200μm(Single)
Electron Bema Source	Pre-centered Tungsten Filament Cartridge		
Acceleration Voltage	1kV ~ 30kV (1/ 5/ 10/ 15/ 20/ 30) – 6 Step		
Display Mode	320 x 240 / 640 x 480 / 1,280 x 960 / 2,560 x 1,920 / 5,120 x 3,840		
Automation Function	Start, Focus, Stigmator, Contrast & Brightness		
Image Format	BMP, JPEG, PNG, TIFF		
Vacuum Pump	Rotary + Turbo Molecular Pump (Fully Automation System)		

SNE-4500M Plus

SNE-4500M Plus model provides ease-of-use and the best performance

of all. Fast moving by fully motorized stage and easy to find sample analyzing location with Top-view camera.

SNE-4500M has magnification of Maximum 150,000x, and it is optimized to surface / cross section analysis with the wide stage composition.

A Type : SE detector and high vacuum

B Type : SE & BSE detector and high & low vacuum

"Tilting -45⁰ to 90⁰ degree"
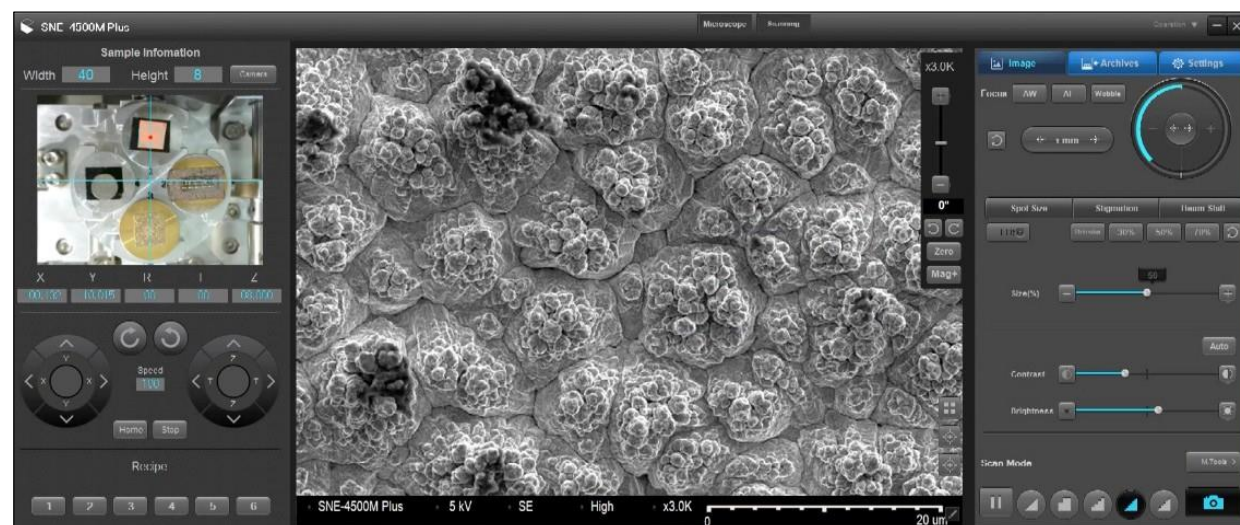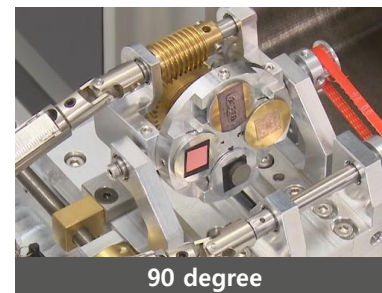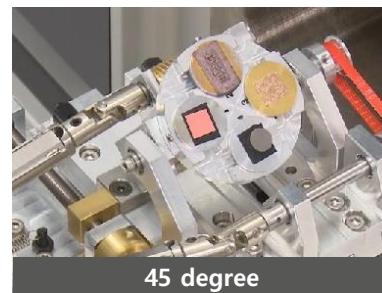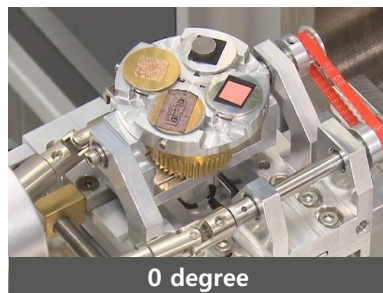
| 0 degree | 45 degree | 90 degree |

| **Navigation Camera Mode** | **Stage Control Mode** | **Recipe Function** |

Sample Images Snap Shot :
Image saving function / Image rotates with Rotation.

X, Y, R, Z, T – 5-axis Moving, Motor Speed Control, Move to Home, Anti-collision function.

Save location(up to 6) and recall
 * re-analyze the same locatio
n.
Able to save SEM analysis conditions and re-analysis in the same condition
.

SNE-4500M

High Resolution Tabletop-SEM

The high resolving power allows real-time specimen inspection up to 100,000x. Obtaining high quality images of extremely small features or particles is made possible by utilizing the standard Variable Aperture(30, 50, 100 ㎛) and optimal sample positioning with omnidirectional control of 5 axis stage.

SNE-3200M

Advanced Tabletop-SEM

Both SE and BSE Detectors are included for SEM image analysis to enable diverse analysis for a wide variety of sample types. Both High and Low(charge reduction) Vacuum modes are standard allowing nonconductive sample analysis without metal coating.

SNE-3200M

Entry-level Tabletop-SEM

The most economical model with optimized spectifications for easy SEM imaging. Able to image samples within 3 minutes from exchanging samples. Optional EDS is available also at entry level prices for precise elemental micro-analysis.

Main Features

SEM UI

User centric software interface provides an easy-to-learn and conveniently organized interface.

Easy Operating Procedures

1 Set accelerating Voltage, detector, and Vacuum mode-->Beam On

2 Navigate to sample with stage motion control

3 Set magnification and adjust focus

4 Adjust contrast and brightness

5 Choose scan mode and save high resolution image
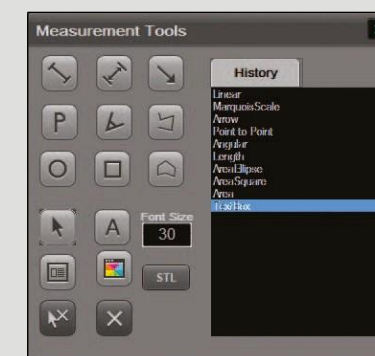
Imaging conditionsand mode setting ▶

1

2

Wide Range of Accelerating Voltages

With 1 ~ 30^{kV} accelerating voltages, it is capable to get various images suitable for each sample's condition. (1/ 5/ 10/ 15/ 20/ 30^{kV})

5kV / 500x

30kV / 500x

5kV / 50x

30kV / 50x
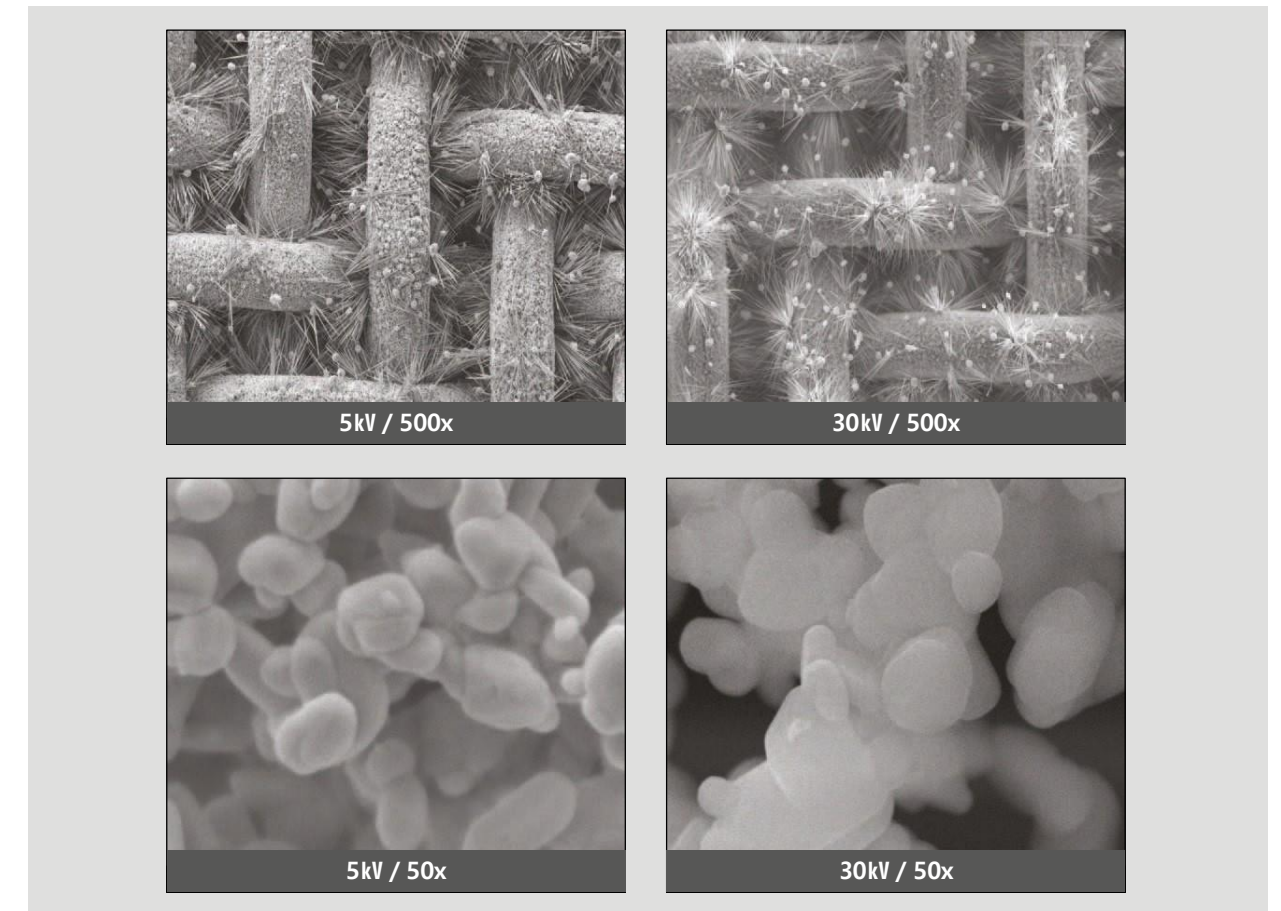
Additional Functions

1 Easy operation with Auto focus, brightness and contrast

2 Dual view mode displays SE/ BSE images simultaneously and saves the detector images selectively

3 GUI is offering the measurement tools for size, angle and extent of the sample and edits tools for the brightness and contrast of saved images

4 Short cut key commands support more precise and rapid SEM imaging

5 It is capable to operate image analysis and measurement tool programs such ad 3D-view, Auto count and colorization by image analyzer

EDS

Energy Dispersive Spectroscopy(EDS) is optionally for analyzing sample composition. EDS is used for qualitative and quantitative elemental analysis by detecting characteristic X-rays generated as a result of the electron beam excitation of the atmic structure. EDS Detectors can be installed on all SEC SEM models and are available with both compact, simplified EDS software or more advanced spectroscopy solutions, all from well known industry standard EDS suppliers.
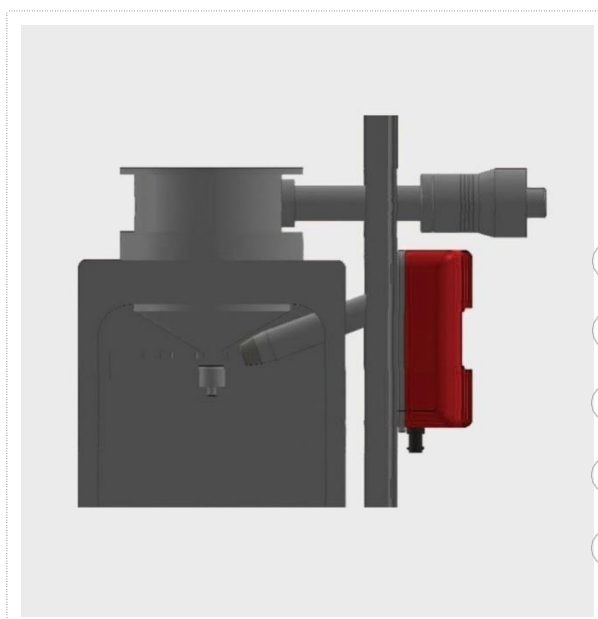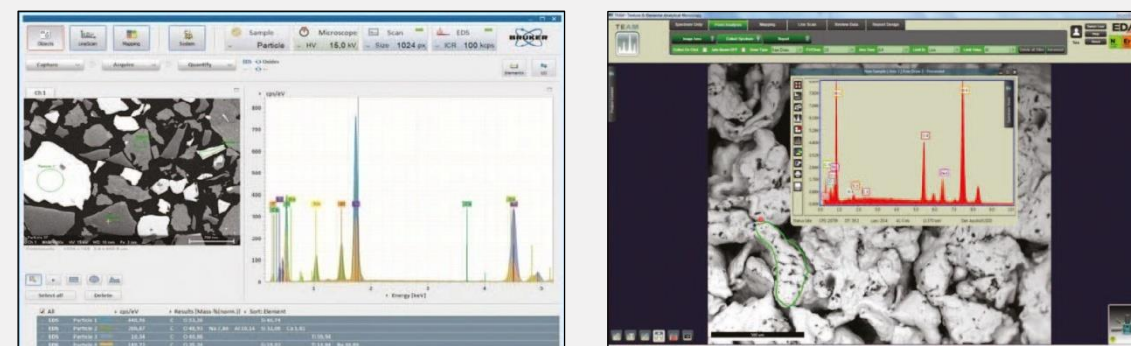
Features

SDD Type – No LN2 required

Able to analyze **light elements with good resolution**

Provides reliable weight or atomic based **quantitative elemental analysis results**

User-friendly interface with **fast and simple manipulation**

Main function include Elemental Mapping Point Analysis, Line Scan, Automated Reporting and more

EDS Software

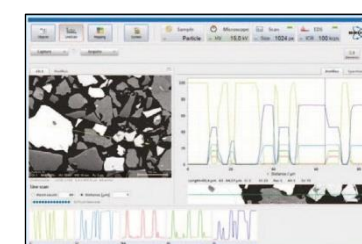| Qualitative or Quantitative Analysis	Line Scan	Mapping
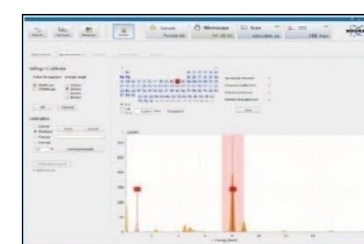
Acquire fast and accurate qualitative or quantitative analysis results with automatic peak deconvolution providing higher accuracy and reliable results for the defined area or point of interest.

The line scan mode provides comparative elemental analysis along a user defined line with element profiles graphically representesd. Great for cross section thickness and elemental transition mizing studies.
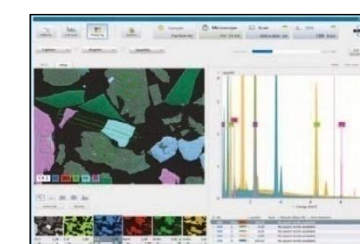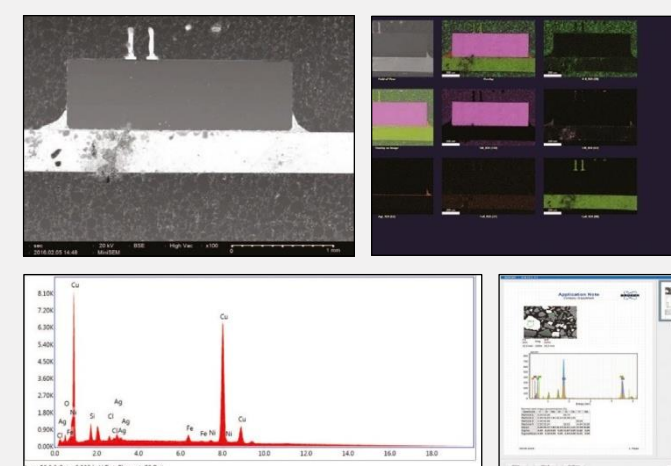
Produce colorized maps with color coded elemental distributions to represent to all the elements present and where they are located within an area of the specimen .
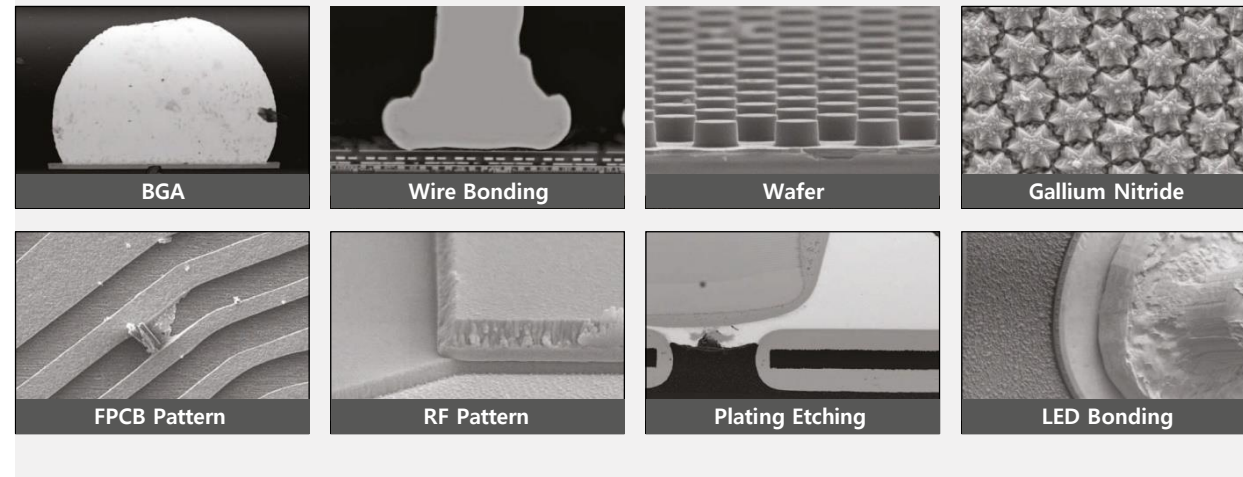
Specifications

Model	X Flash Series	Element
Brand	BRUKER	EDAX
Detector Type	Silicon Drift Detector (SDD)	Ultra-thin Silicon Nitride (Si_3N_4) Window
Energy Resolution	Mn ka ≤ 129 eV	
Detector Active Area	30㎟	25㎟
Detection Range	Boron(5) ~ Americium(95)	
X-ray Throughput	> 150,000 cps	> 100,000 cps

Report

Available for variable report formats and editable with desired formats.

Element	Weight	Atomic %	Net Int.	Error %
O	1.54	5.66	68.23	11.83
Si	2.62	5.50	152.87	9.59
Cl	0.52	0.86	41.08	15.79
Ag	1.97	1.08	85.82	10.24
Fe	2.18	2.30	114.16	8.88
Ni	1.33	1.34	43.87	13.53
Cu	89.83	83.27	2061.44	2.20

SEM Application & Images

Semiconductor & Electronics

BGA	Wire Bonding	Wafer	Gallium Nitride
FPCB Pattern	RF Pattern	Plating Etching	LED Bonding

Energy & Chemistry

Ni Powder	Film	Battery Cell	Oxide Codalt
Solar Cell	CNT	Alumina Powders	Resin

Materials

Fiber	Membrane	Graphene	Polymer
Sio2	ZnO	Diamond Powder	Pharmaceutical

Automotive & Metals

Plastic	Steel Plate	Filter	Metal Etching
PVD Coating	Die Core	Steel Etching	Interlock Molding

Medical & Health

Cosmetics	Cellular (Cencer)	Hair	Implant
Emulsion	Pharm Powder	Instant Noodle	Tooth Bacteria

BIO

Pollen	Stamen	Plankton	Ant
Marine Microalga	SEA Animal	Pistil	Butterfly Wings

COMPARISON (SE / BSE Image)

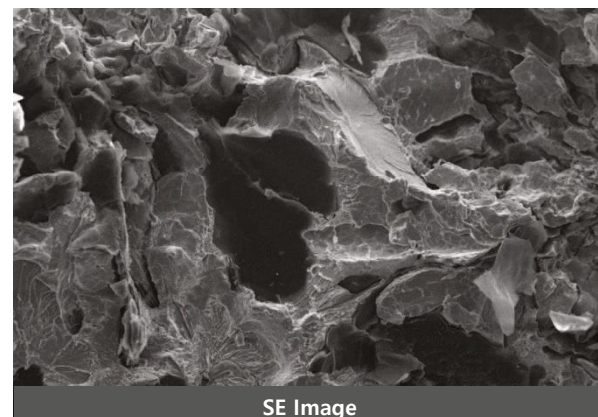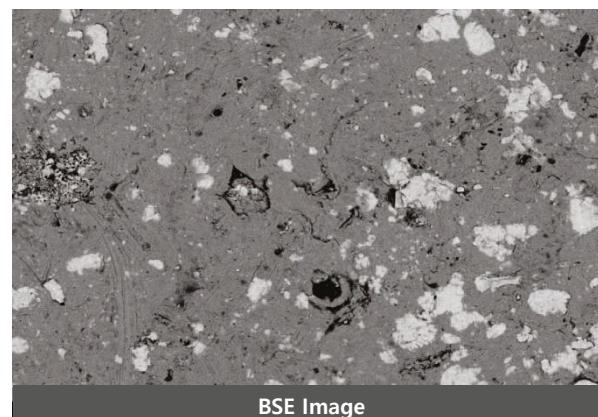| SE - Secondary Electron	BSE - Back Scattered Electron
Provides images with surface topography depicted in fine detail.	Provides images with atomic weight contrast as brighness follows the elemental atomic number.

Smartphone Metal Case

SE Image

BSE Image

Ceramic

SE Image
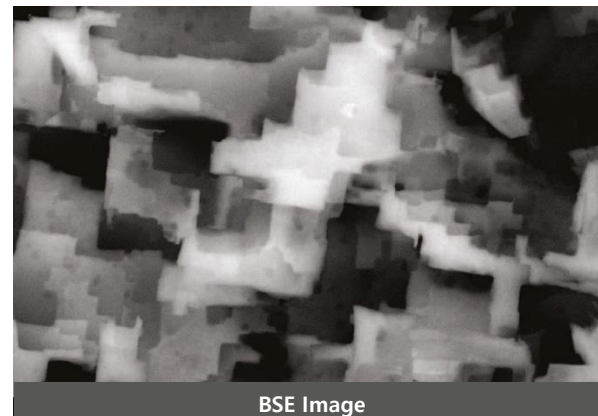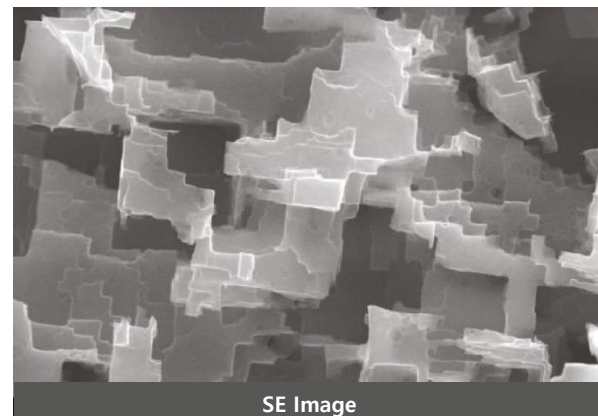
BSE Image

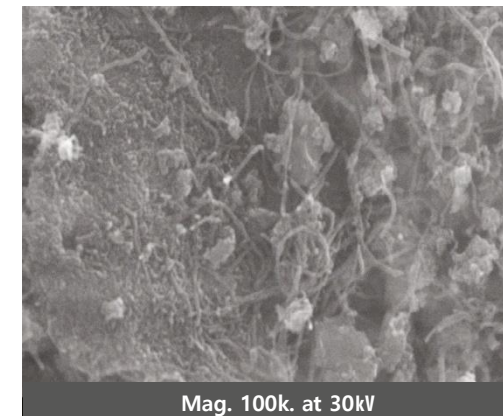## Metal Alloy

SE Image

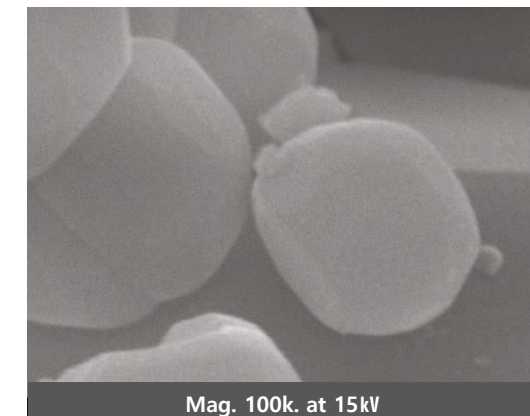BSE Image

High Resolution Performance

SEC's SEM models provide "live" imaging up to 150,000x.
It is offering the high-level resolution image among Tabletop-SEM models and it is able to get the optimal images for sample's features by accelerating voltage.
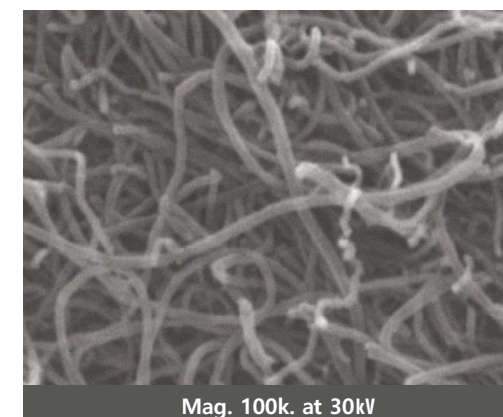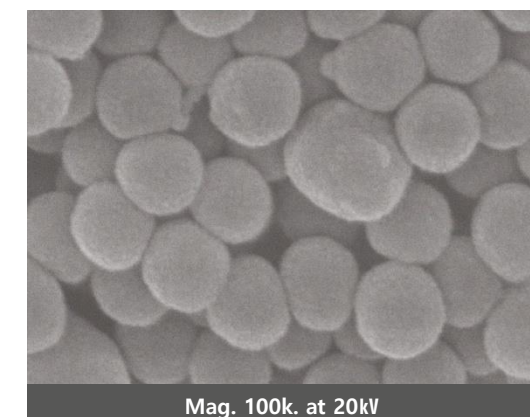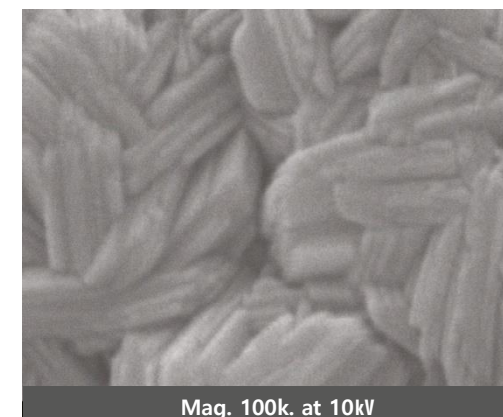
Lanthanum Powder

Mag. 100k. at 30kV

Ceramic

Mag. 100k. at 15kV

Carbon Nano Tube

Mag. 100k. at 30kV

TiO2

Mag. 100k. at 20kV

Battery

Mag. 100k. at 10kV

Emulsion

Mag. 100k. at 15kV
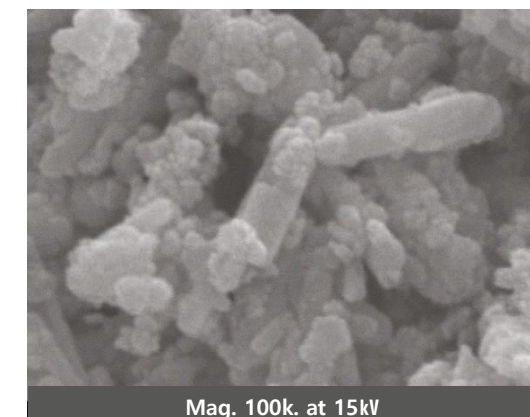
OPTION

Ion Sputter Coater

The Ion Sputter Coater allows for imaging of nonconductive samples in high vacuum mode for the highest resolution imaging. Sputter coaters increase conductivity bycoating the test specimen with afew nanometer thick metal film of Au or Pt. The higher conductivity increases the amount of secondary electron generation and creates higher resolution images.

Coating Target Au or Pt

MCM-100P Quick Mode   **MCM-200** Touch PAD – Advanced Mode

Motorized Stage

A motorized stage is available for all SEM models and increases imaging throughput by allowing the user to quickly navigate around the specimen to find features of interest. Movement is done with either the provided joystick or simply clicking a point of interest within the image to move that point to the image center.
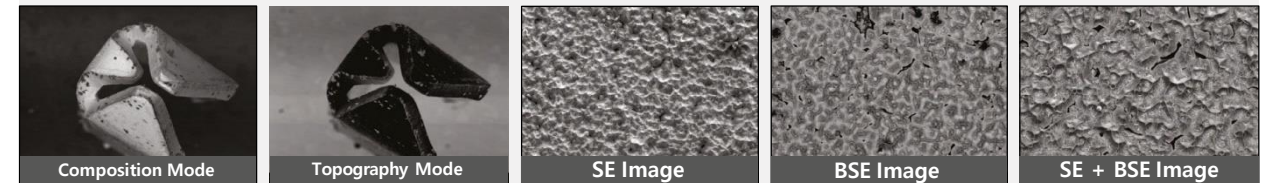
Models

SNE-4500M   **SNE-3200M**   **SNE-3000M**

BSE Detector

| Composition Mode | Topography Mode | SE Image | BSE Image | SE + BSE Image |

Using both SE and BSE detectors, the software allows creating composite images that reveal both topographic and composition combined into a single image – able toget 3-dimensional image.

4-Channel Solid State Type : 4 segment Silicon Diode
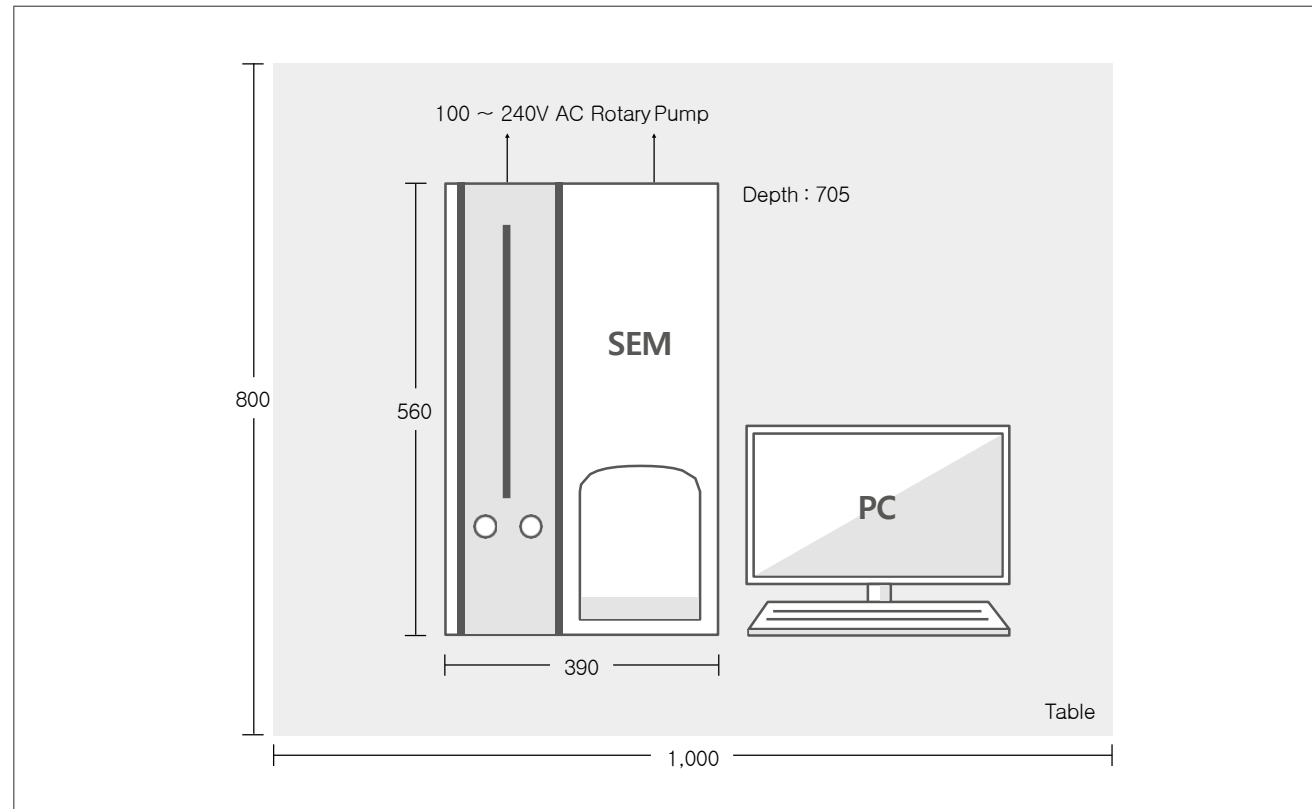
Low Vacuum Mode

| Low Vacuum(BSE) | High Vacuum(BSE) | High Vacuum(SE) | High Vacuum(SE) / Au Coating |
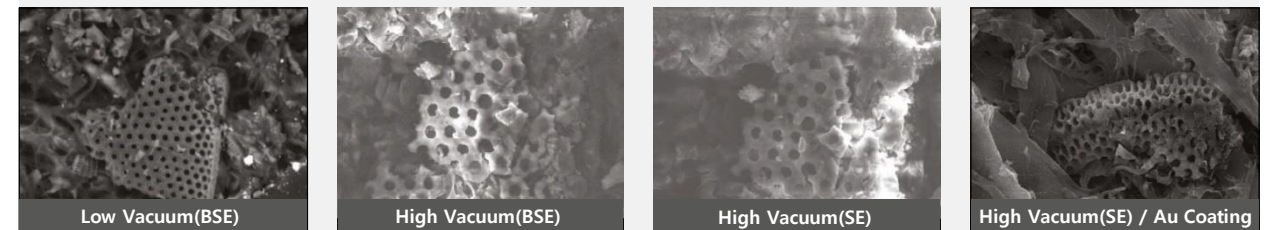
Analysis non-conductive samples – NO conductive coating required.

Charge-Up Reduction Mode(BSED + Low Vacuum)

SEM Spec Overview

Example of Installation Layout

100 ~ 240V AC Rotary Pump

Depth : 705

SEM

PC

800

560

390

1,000

Table

Control System	
OS	Microsoft Window® 7 or 10
CPU	Intel® Core™ 15
Memory / HDD	4GB / 500G
Interface Connector	USB 2.0
Monitor	22 inch Wide

Dimensions and Weight	
Main Unit	390(W) x 380(D) x 560(H), 88kg
Controller Unit	390(W) x 325(D) x 560(H), 30kg
Rotary Pump	400(W) x 160(D) x 340(H), 24kg

Installation Condition	
Temperature	15 to 30℃
Humidity	Less than 80%
Power Source	Single Phase AC 100 ~ 240V 1kW, 50 / 60Hz

Dimensions and Weight
Tungsten Filament(Pre-centered cartridge assembly)
Sample Holders / Stubs(15 & 25 ㎜ dia, 0/ 45/ 90 Tilt)
Carbon Tape
Blower Stor
Storage BOX
Vacuum Grease
Pincette
Working Distance Jig
Tools and Wrenches
Operation Manual & CD

Standard Items Included
SEM Unit
Pump Unit(Rotary + Turbo)
PC(Desktop PC)
Monitor