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BSE Detectors

High-performance BackScatter Electron (BSE) imaging for material scientists, in-situ microscopists and interdependent developers

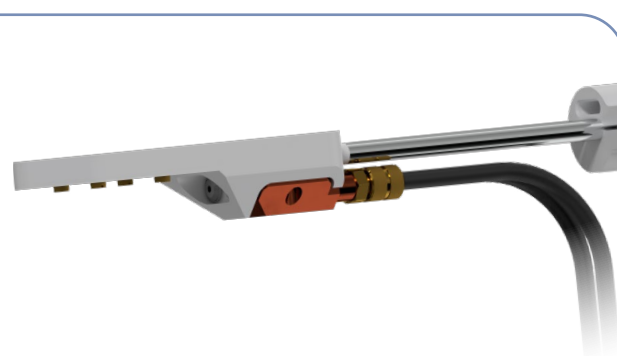


Port-mounted motorized BSE detectors

Carefully selected segmented sensors are perfectly balanced with bespoke electronics and mechanics in a fully self-contained detector designed for ultimate performance and ease-of-use.

Premium Si sensor

Sensitive solid-state Silicon sensor with built-in 4x preamplifiers for ultimate speed and low acceleration voltage



Robust high-temperature sensor

New technology with light-blind metal electrodes in quadrant geometry with built-in 4x preamplifiers and adjustable bias voltage

XY alignment

High-precision lateral alignment with optional motorized repositioning

Built-in motorized insertion

Port-mounted and bellow-sealed with motorized insertion/retraction, and touch alarm

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 point electronic

Built-in amplifier and mixer

Two-stage amplification for each of the four channels, with independent and calibrated controls for brightness and contrast

Standard interfaces

Control over USB 2.0 and analog video signals output on RJ45 connectors

Open control with full access to all detector parameters

Calibration and quantification

Built-in measurement of beam current in the detector Faraday cup, automated zero dark correction and manual control of lowpass filter

Amplification

Easy brightness and contrast control of individual or all grouped channels, including automated brightness/contrast or automated contrast

Python automation

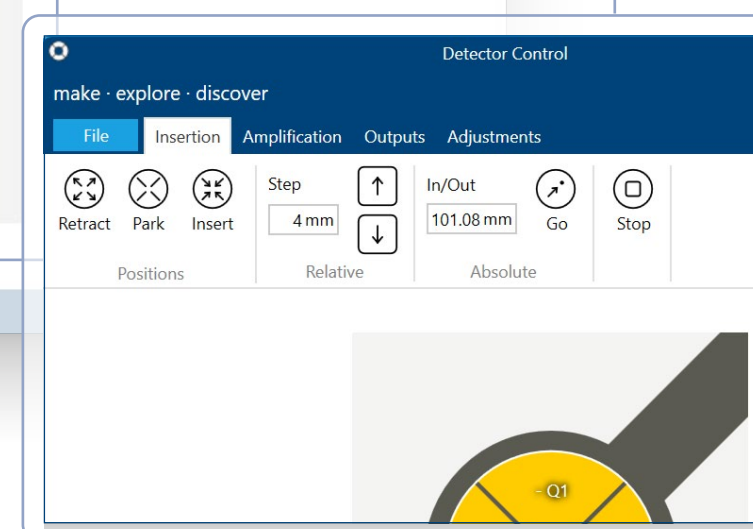
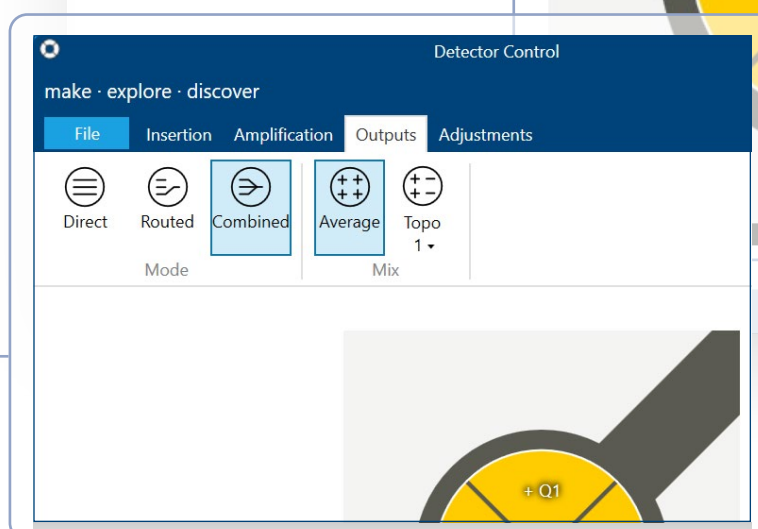
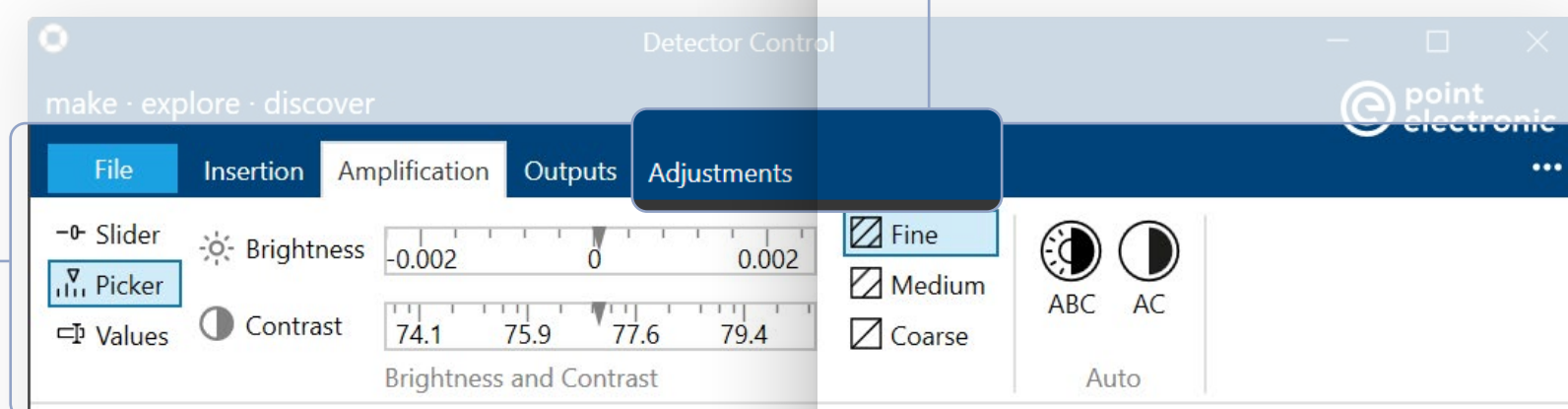
Custom in-situ experiment automation, JSON-RP remote interface for detector control, and local or remote automation over the network

Built-in mixing and routing

Select between direct output of all quadrants, single quadrant routing, or mix to highlight materials or shape

Easy insertion and alignment

Easy insertion to predefined positions, and manual alignment with coordinates input or configurable steps



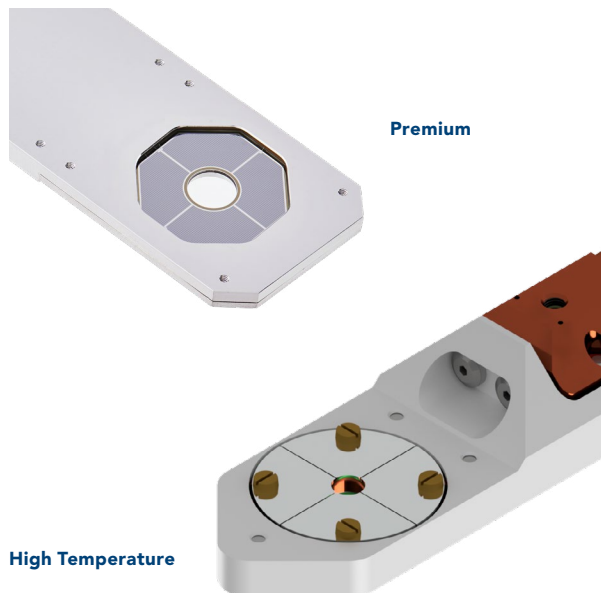
Engineered for performance

Designed for fast and intuitive control, to cover every advanced signal control and automation feature, and to give the best experience even for challenging BSE experiments.



Intuitive, fast and ergonomic

- Heavy-duty hardware control panel for fast access and easy adjustments
- Touch display for status and automated control
- Rotary knobs for very-fine manual control

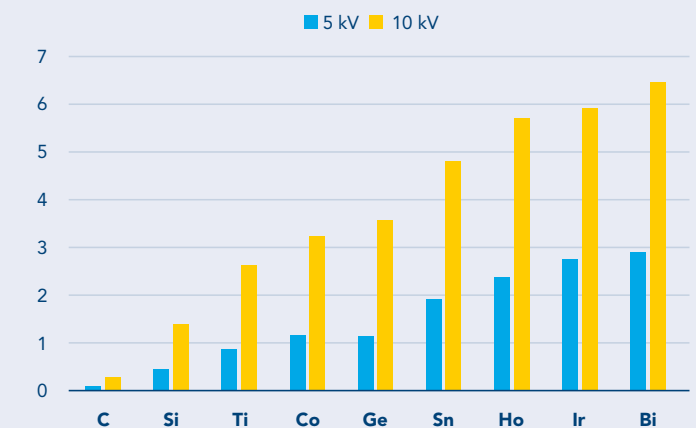


Versatile experiments

- Segmented sensors in quadrant geometries
- Each segment with own brightness and contrast controls
- Size and geometry optimized for materials science

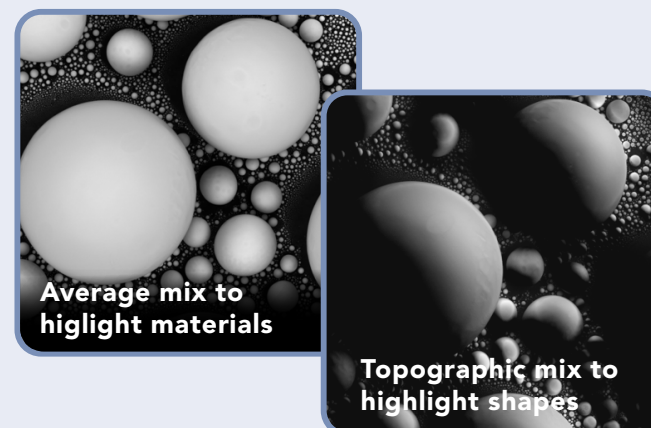
Quantitative measurements

- Electronic gains, offsets and bias are factory calibrated
- Electron current into the sensor can be calculated from voltage at the output of the detector
- Material properties can be determined from quantified input signal



Flexible output

- Output directly all four individual channels
- Combine to a single output with built-in compositional or topographic mix
- Route any channel to a single output

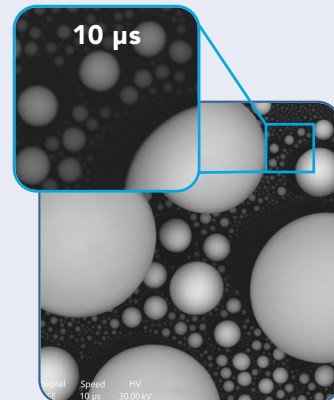
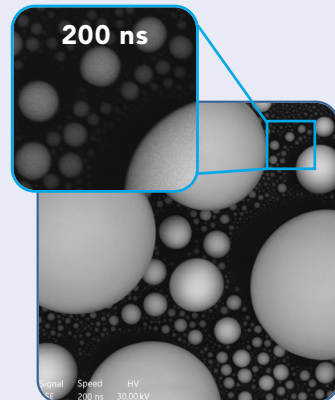


Software Development toolKit (SDK)

- Control libraries for positioning and amplification
- Application Programming Interfaces with simplified functions and physical parameters
- Demo code in Python and other programming languages
- After-sale remote support for developers

Premium BSE detector

Fast, efficient and versatile detector for materials science

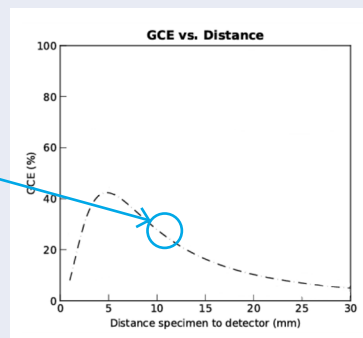
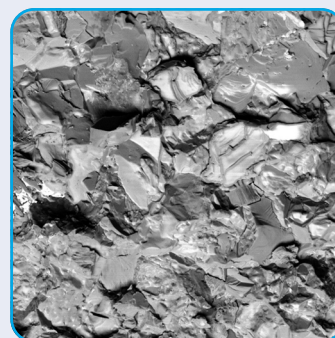
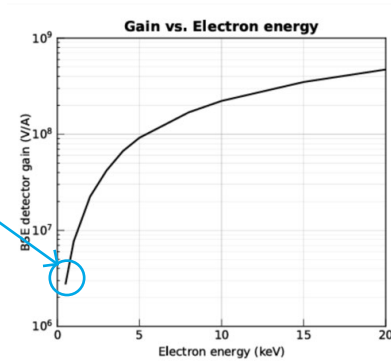
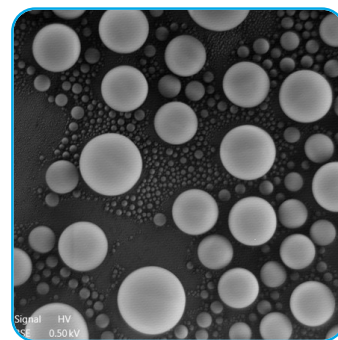


Fast sub-microsecond imaging

- Speed up acquisition, now down to 200 ns/pixel dwell time
- Explore materials live, with fast, sharp and clear BSE signals
- Reduce sample charging with fast scanning and averaging

Low kVs operation

- Reduce acceleration voltage, now down to 0.5 kV
- Increase spatial resolution with a smaller interaction volume
- Avoid radiation damage with a gentler electron beam

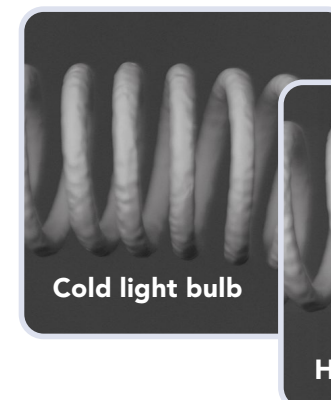


Dedicated for materials science

- Retain a large field-of-view, even with the detector inserted
- Keep the sample at EDS position, with great BSE collection efficiency even at long working distances

High-Temperature BSE detector

Unique, robust and light-blind detector for in-situ/in-operando SEM

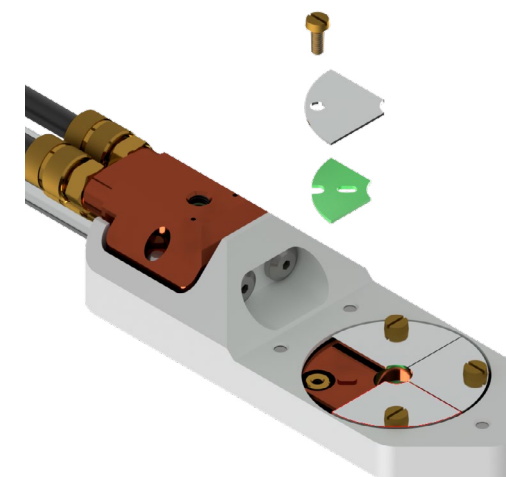
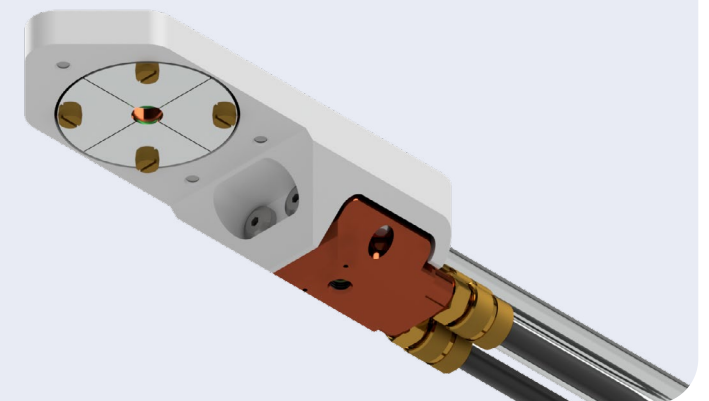


In-situ heating

- Image hot surfaces without interference from emitted light
- Filter low-energy thermal electrons with the built-in detector bias voltage
- Combine with electrical or laser heaters

Water cooling

- Monitor operating temperature with build in thermal sensor
- Keep your detector safe with optional water cooling, even at 1,200°C
- Connect in series to existing heater water cooling hoses



Robust and easy to clean

- Push your experiments with a detector designed to withstand contamination
- Handle with confidence, in and out of the microscope
- Replace, clean and modify your electrode sensors without returning to factory

Premium BSE front-end

Sensor	Detector-grade Si
	Four-quadrant (4Q) geometry
	5 mm inner diameter
	16 mm outer diameter
	0.5 kV minimum acceleration voltage
Pre-amplifier	4x in-situ mount
	10 ⁵ V/A gain
	200 ns minimum dwell time (gain dependent)

High-Temperature BSE front-end

Sensor	Metal electrodes
	Four-quadrant (4Q) geometry
	5 mm inner diameter
	28 mm outer diameter
	-20...20 V voltage bias
Pre-Amplifier	4x in-situ mount
	Galvanic isolation
	5x10 ⁷ V/A gain
	5 µs minimum dwell time (gain dependent)

Electronics back-end

Main amplifier	4x independent signal channels
	-1.25 ... 1.25 V (-50...50 mV with attenuator) input offset
	1x ... 1,800x gain
	-1.25 ... 1.25 V output offset
	3.4 MHz...34 Hz low-pass filter
	Automated 4Q global brightness and contrast
	Automated input offsets (dark correction)
	Automated gain normalization (bright correction)
	COMPO hardware mix signal (mean of BSE1...BSE4)
Interfaces	TOPO hardware mixed signal (mix of BSE1...BSE4)
	1x USB 2.0 for amplifier control
	1x USB 2.0 for motion control
	1x RJ45 signal outputs
Signal outputs	Typ. 4x -0.5...0.5 V output range

Retraction/insertion mechanics

Mechanics	Port mounted, with vacuum bellows
	Motorized insertion/retraction motion
	-4...4 mm lateral and height alignment
	10 µm repositioning step size
	Touch alarm, with automated stop and retraction

Display panel

Configuration	Panel interaction with software via events and actions
	Auto Brightness & Contrast, Auto Contrast, Auto Zero
Display	Display 480 x 800 px (4.3")
	Resistive touch
Encoders	4 encoders
	360 increments per revolution
	Beeper and vibration motor for haptic and acoustic feedback
Housing	Sturdy metal housing for stability
Interface	USB interface for control and power

Detector Control app

Control	Detector schematic with selectable quadrants
	Bias, brightness and contrast controls
	Individual quadrants, or grouped control
	Automatic inserted/retracted positions
	Fine repositioning/adjustments in mm units
In-situ automation	JSON/RPC interface for remote control
	Automated brightness and contrast
Operating system	Windows 11 ... Windows 7

Parts and cables

BSE detector	Standard 1x
Display panel	Standard 1x
Flange adapter	Standard 1x
Power adapter	Standard 1x
Signal cable	Standard 1x
USB control cables	Standard 2x
USB flash drive	Standard 1x

Software packages

Drivers	PEUSB
Libraries	MICSControl, LIMAControl
Software	Detector control app

Weight and dimensions

BSE detector	typ. 50 x 16 x 16 cm, typ 5.5 kg
Display panel	20 x 15.5 cm, 0.9 kg
Flange adapter	typ. 11 x 3 x 5 cm, typ 0.5 kg
Power adapter	typ. 36 x 32 x 60 cm, typ 7 kg
Shipping	typ. 36 x 32 x 60 cm, typ 7 kg

Site requirements

Power	1x mains 108..253 VAC single phase 50/60 Hz
Microscope	1x to 4x video signal inputs on the SEM electronics
	Free BSE port on the SEM chamber
PC	Windows 11...7

Our design principles

We look back on over 30 years of experience in development and manufacture of high-performance instruments and technologies for microscopy.

We are driven by an ambition to expand abilities and to improve performance of electron microscopes.

Our aspiration is to make the best quality tools and to join our customers on their journeys of scientific exploration and discovery.

Performance

Microscopy must be a reliable and enjoyable experience

- Design for highest speed and resolution at the lowest noise
- Develop smart independent controllers for live optimization
- Support new users with simple and automated controls
- Assist advanced users with access to all parameters

Efficiency

Microscopes must provide an uninterrupted focus

- Use standard microscope controls and data formats
- Give instant feedback with live image mixing and processing
- Add bespoke software tools and algorithms for repetitive tasks
- Enable more developers with libraries and documentation

Environment

Products and technologies must be sustainable

- Reduce power consumption through smart design
- Minimize material use, embrace reuse where possible
- Save weight and volume for shipping and maintenance
- Enable everyone to develop sustainable innovations

Quantification

Data and control must be in physical units

- Calibrate, in production, for measured inputs and outputs
- Provide samples, procedures and software for calibration
- Give all control parameters in device independent values
- Ensure safe operation according to IEC61010-1 and IEC 61326-1

point electronic GmbH
Erich-Neuß-Weg 15 | 06120 Halle (Saale) | Germany
Tel.: +49 345 1201190 | info@pointelectronic.de
www.pointelectronic.de

