

Symmetry is the first (and only) truly 'all in one' detector solution for EBSD

- Highest speed – maximum speed more than double that of previous generation
- Highest sensitivity – fast analysis at lower beam current; fast analysis at lower kV
- Highest resolution – sharpest EBSPs

Symmetry offers the highest real-time indexing speeds and the highest sensitivity and the highest resolution patterns – all in a single detector

Symmetry uses next-generation CMOS image sensor technology coupled with high-efficiency, high-resolution optics to deliver break-through performance across the entire EBSD application range

Camera

Image sensor:	High-speed, low-noise CMOS, customised for EBSD
Image size:	1244 x 1024 pixels (max.)
Digitisation:	12 bit (on-sensor)
Optics:	Custom design, high efficiency, high-sharpness
Distortion:	< 1 pixel Each camera is tested in production by imaging a precisely formed grid.
Screen format:	Rectangular; matches and uses full area of sensor
Standard screen phosphor:	Optimised for best performance across all applications

SEM Interface

The chamber port interface is customised for the geometry of the SEM model; it is bellows-sealed for complete vacuum integrity during all operations.

Symmetry has precise, two-axis (insertion and elevation) control of the working position with respect to the sample for optimum geometry in all EBSD applications. Automatic compensation of EBSD calibration during screen positioning (no re-calibration necessary).

Port diameter:	48 mm (min.)
Footprint (external):	Height 138 mm length 416 mm, x width 91 mm

Insertion:

Control:	Motorised (via AZtec ® on system PC or remote handset)
Range of movement:	minimum: 0 mm - screen stows safely behind the chamber wall maximum: 200 mm
Speed (max.):	15 mm/s
Precision:	<10 µm

Elevation:

Control :	Motorised (via AZtec on system PC or remote handset)
Range at full insertion:	+/-22.9 mm
Collision / Proximity alarm:	Collisions may be detected before they occur, reducing the potential for costly system down-time and repair

Calibration

Geometry calibration:	One-off calibration at installation.
For routine use:	No further calibration is necessary (AZtec accurately computes Pattern Centre, Detector Distance and Detector Orientation to suit the chosen operating conditions (SEM WD; detector Insertion Distance and Elevation))

AZtec Background Correction

Dynamic Background:	This auto-background correction is optimal for most applications (no reference image necessary)
Static Background:	For best correction in certain applications (requires a reference image)

EDS Integration

Fully integrated on AZtec platform.	
EBSD & EDS simultaneous acquisition at >3000 pps.	
Nose design:	Tapered to prevent shadowing of other detectors.

Analytical Performance

Symmetry combines high speed with optimal sensitivity for operation across all application regimes:

Exceptional operation at low beam current (100 pA) and low kV (e.g. 5 kV). Exceptional performance in all camera modes. Four imaging modes are available, with pixel resolutions as indicated. The table indicates the imaging speed and the sensitivity for each mode.

Speed (patterns per second) – is specified as a lower limit for the maximum throughput achievable for real-time, Hough-based analysis at >99% hit-rate.

Sensitivity (solved patterns per second / nA) – the indicated speeds can be achieved at the indicated beam currents on favourable samples (e.g. silicon; Ni; steels); a sensitivity is thus defined in units of pps/nA.

Mode	Pattern size [pixels]	Max real-time EBSP throughput (pps)	@beam current
Resolution	1244 x 1024	>240	≥ 400 pA
Sensitivity	622 x 512	>250	≥ 250 pA
Speed 1	622 x 512	>800	≥ 3 nA
Speed 2	156 x 128	>3000	≥ 12 nA

Typical performance on Ni, steel, at 20kV, at typical analytical conditions @99% hr

Angular resolution:	0.05°
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Z-contrast, Orientation Contrast and Topographic Contrast Modes

(As option or as retro-fit)

Discrete diode detectors are used for these specimen imaging modes.

Diodes enable imaging independent of the EBSD camera for ultimate speed and sensitivity.

All diodes are angled towards the sample for maximum signal detection.

Backscatter position: 2 diodes above screen for optimised atomic number contrast imaging

Foreshatter position: 3 diodes below screen for optimised orientation contrast imaging (with false-colour imaging) and topographic contrast

Speed: Adjustable dwell time enabling useable imaging at $> 10^6$ points per second

Dynamic Studies

User exchangeable nose piece incorporating an IR filter suitable for *in situ* experiments

Environmental Specification

Operating conditions: 15°C to 30°C, less than 85% relative humidity, non-condensing.

Storage conditions non-condensing

Development Standards

EMC approved to EN61326-1

Manufactured to ISO9001, 14001 & 18001

www.oxford-instruments.com/symmetry

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