Technical Data Sheet

Symmetry S3 EBSD Detector

Symmetry S3 is the only truly 'all in one' detector solution for EBSD

- Highest speed – maximum speed > 5700 patterns per second (pps)

- Highest sensitivity – fast analysis at lower beam current; fast analysis at lower kV

- Highest resolution – sharpest EBSPs

Symmetry S3 offers the highest real-time indexing speeds and the highest sensitivity and megapixel resolution patterns – all in a single detector

Symmetry S3 uses next-generation CMOS image sensor technology coupled with high-efficiency fibre-optics to deliver breakthrough 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 fibre-optics

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 integration

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 S3 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)

Maximum range at full insertion: +/-22 mm - achievable range is SEM dependent.

Proximity Alarm Sensor

Collisions will 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 working distance, detector insertion distance and detector 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).

Analytical Performance

Symmetry S3 combines extreme 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. Five 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 (on Ni or steel).

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 and the maximum sensitivity of the detector is 1000 pps/nA

Mode	Pattern size [pixels]	Max real-time EBSP through-put [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
Speed 3	156 x 88	> 4500	≥ 15 nA
Speed 4	156 x 128	> 5700	≥ 20 nA

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

Angular resolution: 0.05˚

EDS Integration

Fully integrated on AZtec platform.
EBSD & EDS simultaneous acquisition at > 5700 pps.

Nose design: Tapered to prevent shadowing of other detectors.

Integrated Forescatter Detectors

(As option or as retro-fit)
Discrete diode detectors around the phosphor screen are used for a variety of 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

Forescatter 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

An optional high temperature, exchangeable nose piece is available. This uses a novel optical interference filter to remove unwanted infrared signal with minimal impact to sensitivity, enabling in situ experiments up to 1000 ˚C.

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 Safety approved to EN/UL 61010-1

Manufactured to ISO9001, 14001 & 45001

Visit **nano.oxinst.com/SymmetryS3**

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