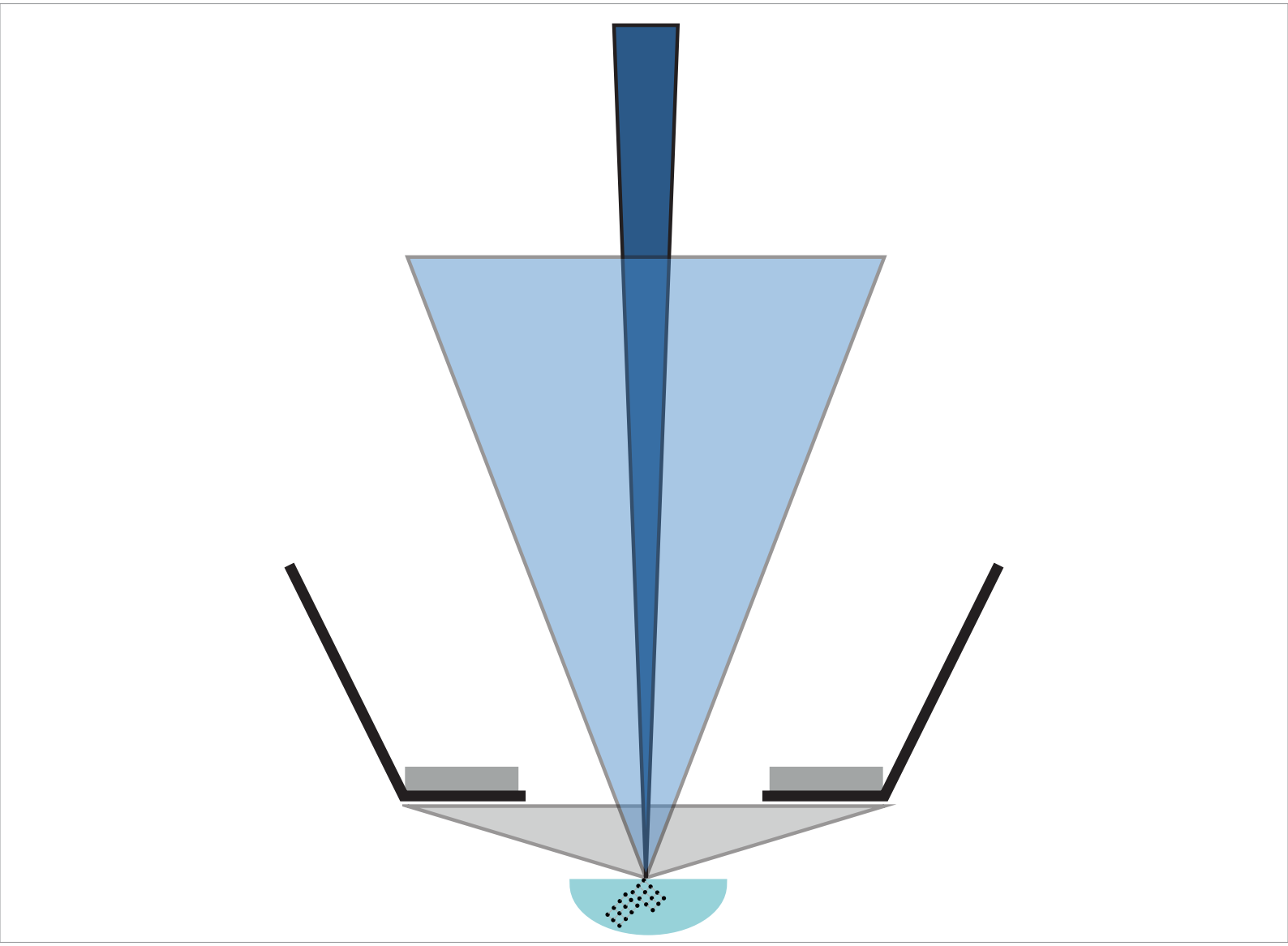


# AsB Detector

## Showing Material Contrast and Topographical Information with the AsB Detector

We make it visible.

# AsB Detector

## Showing Material Contrast and Topographical Information with the AsB Detector

Contact: Dr. Ulrich Kohl-Roscher

Date: December 2013

**Visualize crystal orientation and compositional contrast.**

### Introduction

With an integrated GEMINI lens detector, you are enable to select and separate the BSE signal by both Z contrast and angle contrast. The high angle BSE electrons are detected in the unique, in-column, energy selective, EsB detector. Large and very large angles, coming from different scattering processes, are collected in the AsB detector or the angular selective BSE detection system.

### Availability

The AsB detector is available for the following Field Emission Scanning Electron Microscope series:

- Σ-series
- 15xx (from serial no. 2000)
- SUPRA series
- ULTRA series
- MERLIN series (Smart AsB)

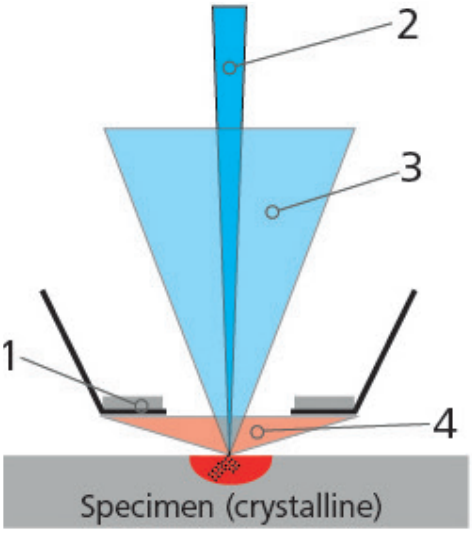
### Benefits

- Contrast and topography
  The AsB detector allows you to show channelling contrast (crystal orientation), as well as compositional contrast.

- Rutherford (RBS) and Channelling (Mott scattered) BSE electrons can be separated due to the different multiple inelastic (RBS = Z-contrast) and single elastic (MBS = crystallographic contrast) scattering mechanisms. The different scattering processes can be detected as there is almost no magnetic field (<0.3mG) outside of the GEMINI column. This means Z-contrast and crystallographic (orientation or deformation contrast) information can be used to characterize crystalline samples. As multiple inelastic scattering is minimised, it also means the images appear very sharp.

- Ease of use
  The AsB detector is completely integrated into the pole piece of the GEMINI lens. This allows you to image BSEs with ultra short working distances without aligning the AsB detector to the optical axis.

**Figure 1**

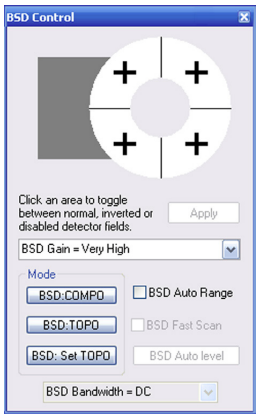



*Schematics of the AsB detector*
*When the primary electron beam hits the specimen, backscattered electrons (BSEs) are released from the specimen. These BSEs are detected by the diodes and generate an image. 1: integrated Detector, 2: e-beam and LL-BSE (only with EsB detectable), 3: Rutherford BSE, 4: Channelling BSE*

**Figure 2**

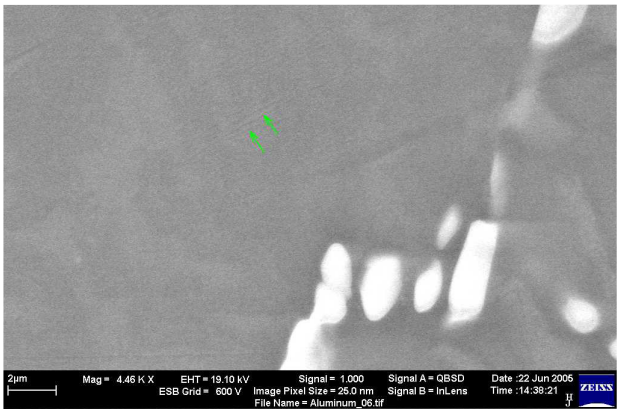
## Operation

*The AsB detector is fully software-controlled. It is equipped with four diodes that can be controlled independently via a menu.*
*Compositional mode (COMPO) produces images showing the atomic contrast of the specimen. Topography mode (TOPO) shows surface details.*




*BSD panel, which controls the AsB detector*

**Figure 3**




*A Rutherford BSE image of an aluminium specimen shows barely visible „scratches". See Figure 4 for an image of the specimen in MBS mode, detecting channelilng BSEs.*

## Upgrade path

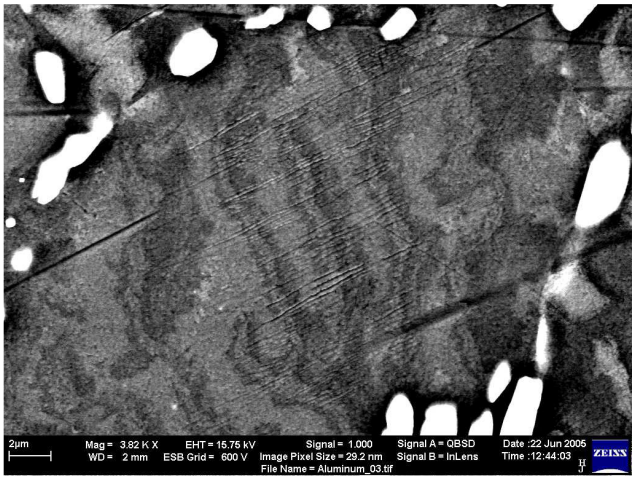
Requires SmartSEM V05.01.04 or higher.
On all instruments except MERLIN: requires a free port on the scan generator. Alternatively, a multiplexer board can be retrofitted to allow an additional detector to be operated.
On MERLIN: If there are already four detectors installed on the MERLIN system, an additional ADC4 detector board must be retrofitted (since the standard configuration is meant to handle only four detectors).

| | |
|---|---|
| ADC4 detector board (MERLIN) | 346001-9220-000 |

The retrofit must be done by an authorised Carl Zeiss Microscopy service engineer. For further information, contact: microscopy@zeiss.com

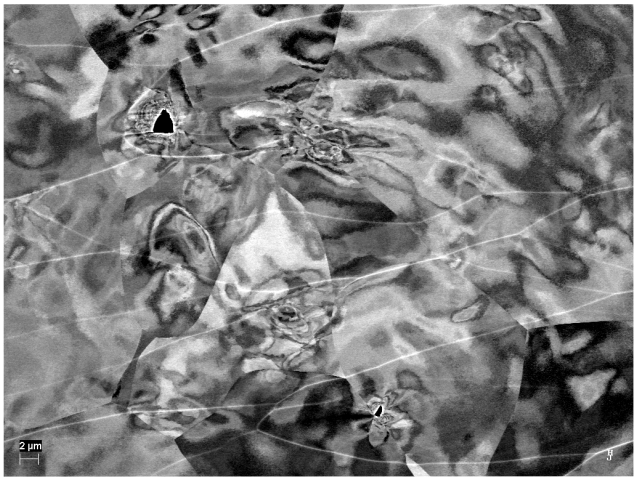
| Part | Ordering no. |
|---|---|
| AsB Upgrade Kit, complete kit including all needed hardware. | 347806-9014-990 |
| Smart AsB Upgrade Kit (for MERLIN only) | 346006-9010-990 |

**Figure 4**




*With an AsB image in MBS mode it becomes clear that the „scratches" are dislocations. Vertical broad shadows are orthogonal to the rolling direction.*

**Figure 5**




*Strain deformation in steel with razor sharp dislocations*

**Carl Zeiss Microscopy GmbH**
07745 Jena, Germany
microscopy@zeiss.com
www.zeiss.com/microscopy

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