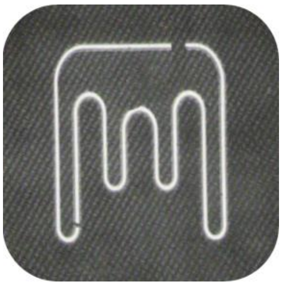
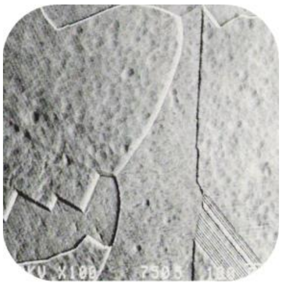
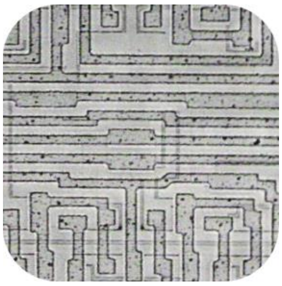
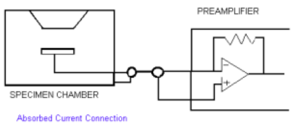
Detectors

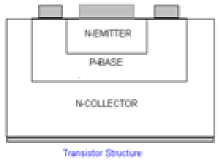
SEM Specimen Current EBIC Amplifier

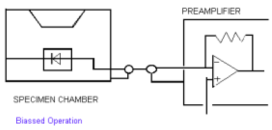


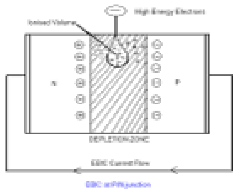












Applications & Features:

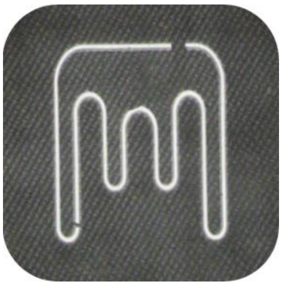
- Absorbed current measurement
- Absorbed current imaging
- Compatible with biased specimens
- EBIC Imaging

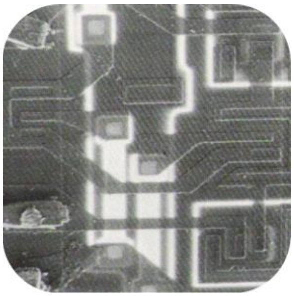
The Specimen Current-EBIC Amplifier is designed to operate with the small currents absorbed by the sample in the Scanning Electron Microscope. It gives accurate absorbed current measurements but will also provide images over a wide range of probe currents.

At the higher probe currents, TV rate images are possible, and at slow scan, low noise images can be produced. Its differential input capability permits the specimen to be floated by up to 5 volts from ground.

When a high-energy electron penetrates a crystalline semiconductor, most of its kinetic energy is absorbed by ionization of the silicon atoms as silicon valence electrons are ejected from their orbits. Each ionization creates a free electron and the empty valence site leaves the atom electrically unbalanced with a net positive charge. This net positive charge called a hole appears to migrate from atom to atom under the influence of an external field creating the illusion of a flow of positive charge.

At the interface of P-doped and N-doped regions there is a narrow zone void of mobile charge carriers due to the electric field (Fermi Potential) created by the redistribution of electrons and holes at the junction. If the electrons and holes created by the impinging electrons can enter this Depletion Zone, then they too will be swept aside by the Fermi Potential. This movement of charge carriers manifests itself as a current in an external circuit.





In Silicon the average electron hole pair requires about 3.6eV of energy so that the external current, which is proportional to the number of carriers entering the Depletion Zone, may well be two to four orders of magnitude greater than the primary beam current depending on the primary beam energy and the percentage of the pairs that can be absorbed into the Depletion Zone. This phenomenon is known as Electron Beam Induced Current or EBIC. This same effect can be induced by photon bombardment and is the basis for the operation of photodiodes and solar cells.

Modern planar semiconductor devices, because of their uniquely two-dimensional structure, lend themselves readily to both qualitative and quantitative investigation by the EBIC technique in the Scanning Electron Microscope and also in the Laser Scanning Microscope (OBIC).

While the inspection of un-passivated devices is desirable, **EBIC** can be readily performed on finished passivated devices and can, in fact, reveal information about the thickness of the passivation layer and the junction depths. Spatial spreading of the **EBIC** pattern can provide information on the carrier lifetimes and diffusion lengths which, in turn, are indicative of resistivity and crystal orientation. The **EBIC** method can also be used inspect the quality of wafers destined for semiconductor manufacture, by applying a suitable junction layer over the surface and forming a large area junction beneath. Crystal defects such as grain and twin boundaries, stacking faults and screw dislocations form trapping (recombination) centers for the electron hole pairs and produce distinct reductions in the **EBIC** Current output when the beam strikes in the vicinity of such defects.

Specifications:

- Current Ranges 10-5A to 10-11A:

	VISUAL	RECORD
Range (amps)	Line period	Line period
10-5	TV	1mS
10-6	TV	1mS
10-7	TV	2mS
10-8	TV	2mS
10-9	1mS	2mS
10-10	2mS	4mS
10-11	5mS	10mS

- Output video level to suit SEM
- Display 3-digit LED with range displays and over–range indication
- Size 210mm(W) x 130mm(H) x 290mm(D)
- Separate Preamplifier
- Power, 100, 120, 220 & 230v AC 50/60Hz
- Warranty Period: 12 months from date of purchase
- Optional electrical feed-trough’s and specimen holders

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