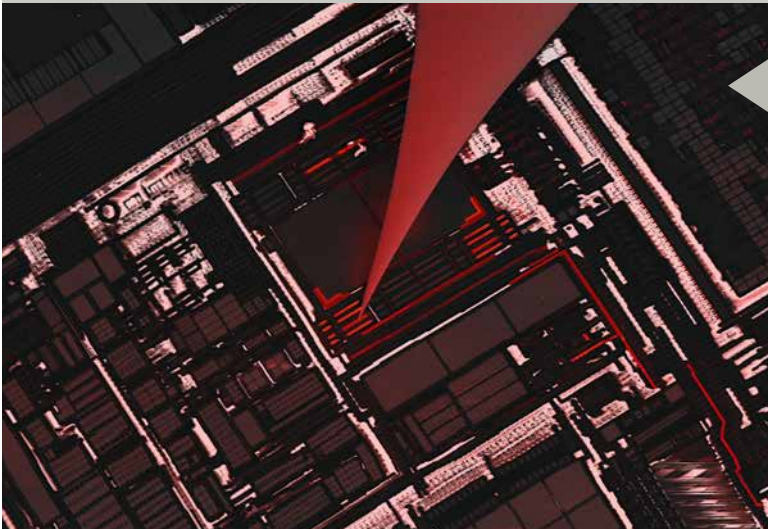


EBAC/RCI acquisition

The lowest noise Electron Beam Absorbed Current (EBAC)
and Resistive Contrast Imaging (RCI)

Find exact location of any open, resistive or shorting defect

- Localize metal line cuts caused by cracking, corrosion, electro-migration, or foreign particles
- Identify resistive opens caused by interface contamination at via interconnects
- Pinpoint location for direct TEM lamella FIB preparation

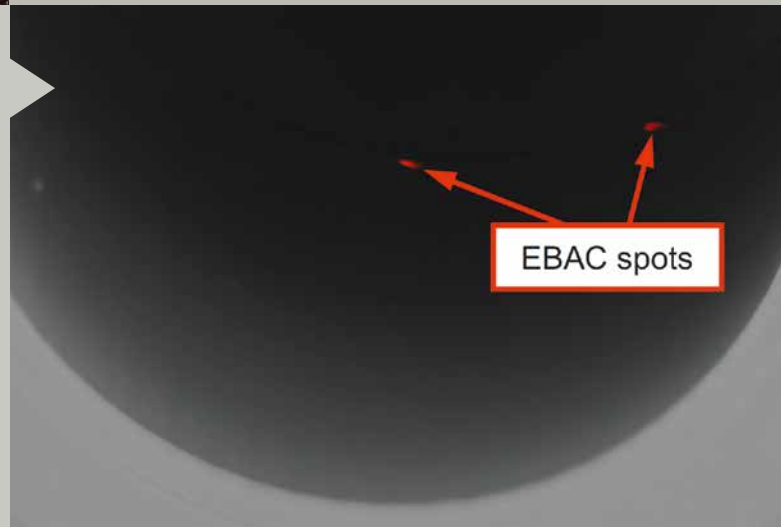


Characterize interconnects with highest resolution

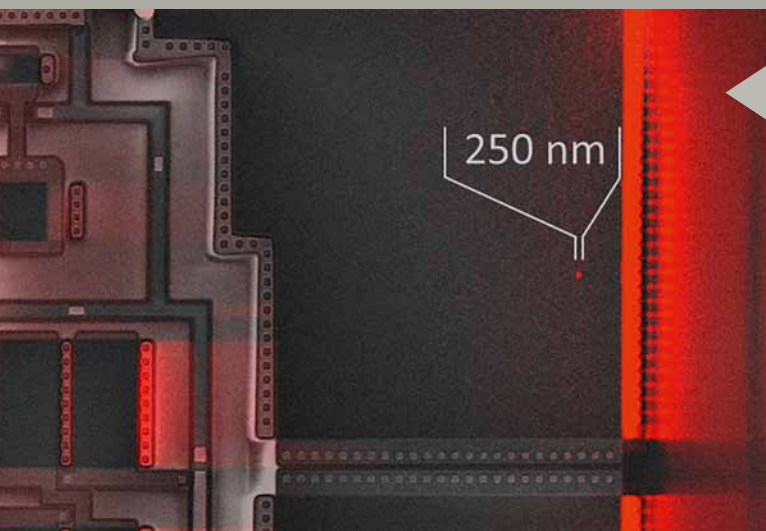
- Reveal electrical integrity of nets with sub-micron lateral resolution and bridge from EFA to PFA
- Diagnose fabrication and long term issues, including contamination, metal patterning defects, resistive interconnectors, or electro-migration
- Directly isolate defects to the exact layer and die location, and improve time to product improvement actions

Verify device operation modes with built-in biasing for voltage contrast

- Image bias/voltage contrast in delayered devices
- Monitor operation of devices under bias
- Compare imaged behaviour with device design



The unique benefits of EBAC/RCI

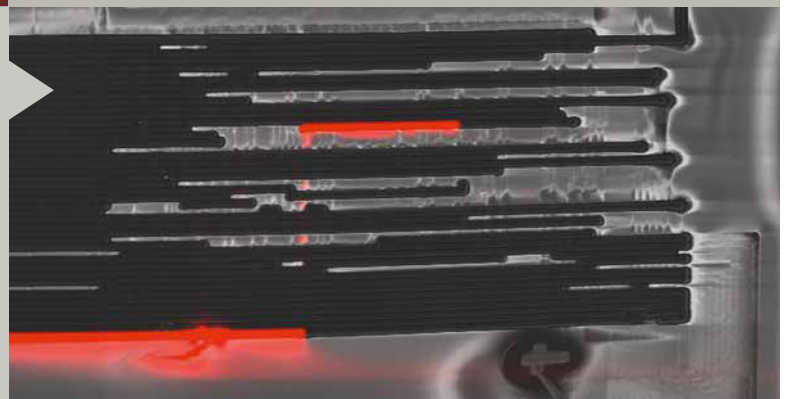


Localize defects in thin dielectric layers

- Visualise and localise weaknesses in gate oxide (GOX) and capacitor oxide (COX) before breakdown
- Pinpoint oxide shorts caused by ESD or EOS with sub-micron resolution
- Preserve the original defect signature with power dissipation in the lower nW range during localization

Access failures invisible in voltage contrast

- Find low resistances that allow charge tunnelling through the interconnects
- Investigate structures in contact with the silicon substrate
- Characterize large metal structures

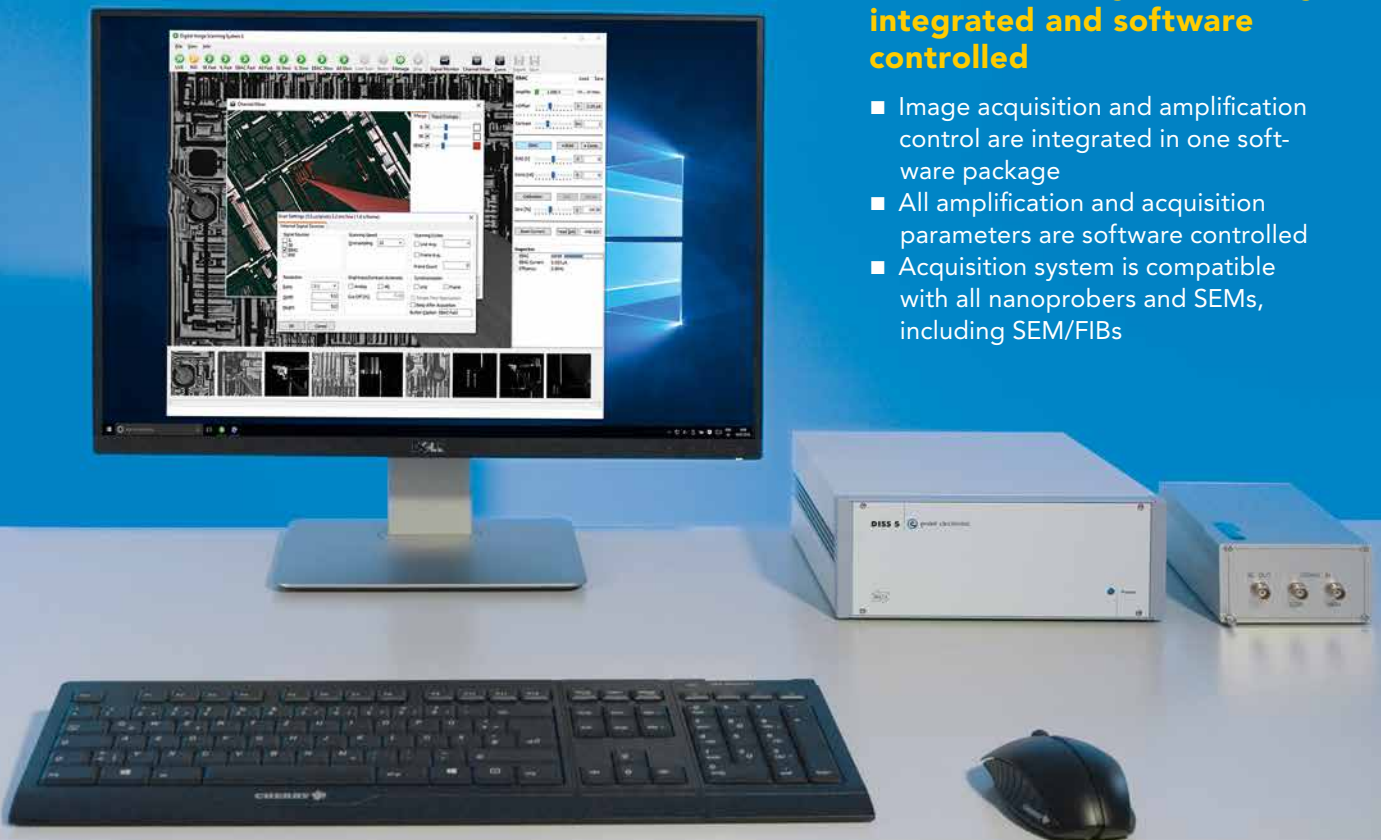


EBAC/RCI

The lowest noise electronics for EBAC/RCI

The EBAC/RCI system is fully integrated and software controlled

- Image acquisition and amplification control are integrated in one software package
- All amplification and acquisition parameters are software controlled
- Acquisition system is compatible with all nanoprobe and SEMs, including SEM/FIBs



The most powerful and versatile SEM acquisition system – DISS5

- Integrated scan generator and image acquisition
- Very large image resolution, up to 16k x 16k pixels
- Very fast scanning speed, down to 200ns dwell time
- Simultaneous 4 analog inputs and 12 digital inputs



EBAC/RCI

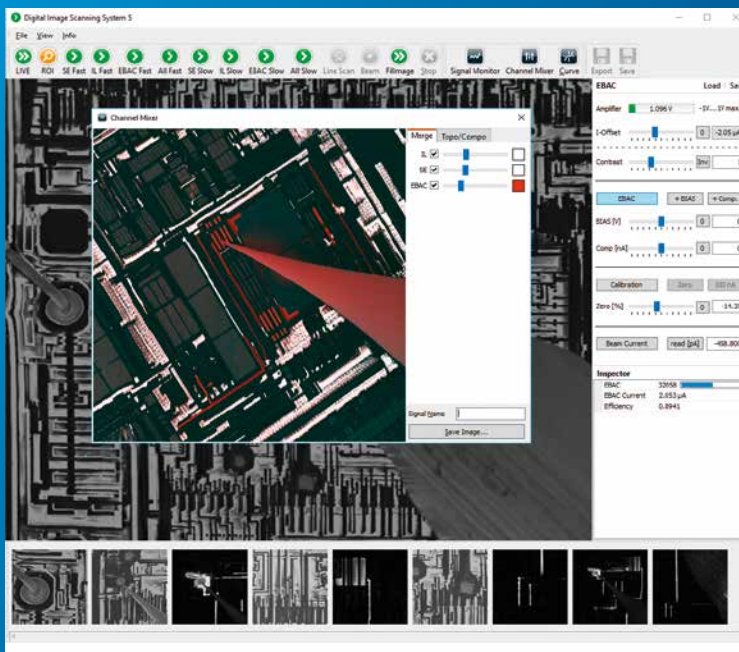
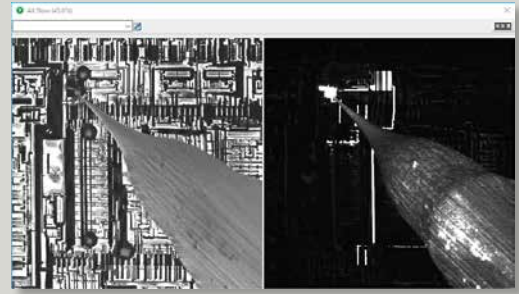
Lowest noise EBAC/RCI amplification with in situ pre-amplifier and ex situ amplifier

- In situ pre-amplification is optimised and fixed at 10^7 V/A
- Second stage amplification optimizes signal for analog to digital conversion
- Signal is digitised at 12-bit to minimise quantification noise



Simultaneous signals are mixed for localization, including SE, BSE or CL

- Up to 4 simultaneous signals
- 12-bit digitization with signal integration
- Live colour mixing tool for visualisation

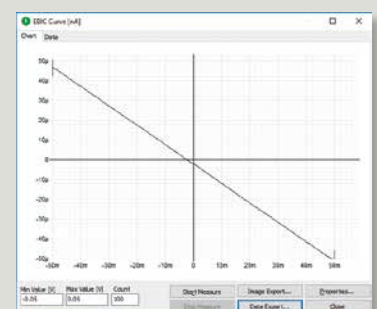


The EBAC/RCI system is software controlled for complete calibration and quantification

- Signal is automatically quantified and displayed in current units (μA , nA , pA)
- Scan control, image acquisition and amplifier control are integrated in one software package
- All amplification and acquisition parameters are accessible to the end user

Current-voltage (IV) is integrated for assisted touchdown and device characterisation

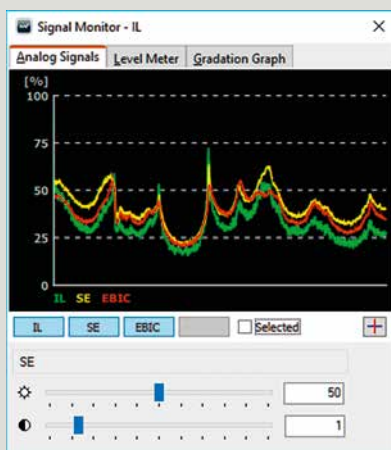
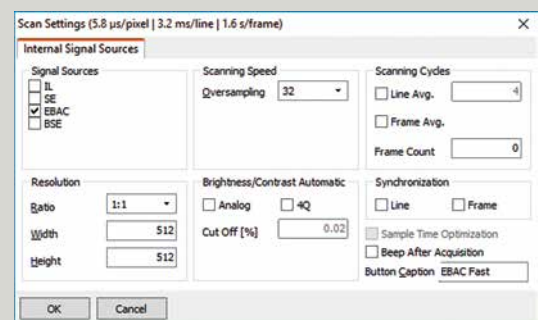
- Voltage output range is from -10V to 10V
- Gain selection for current measurement is automatic
- IV data may be exported in standard formats



EBAC/RCI

Configurable scan profiles provide custom workflows for most efficient microscope use

- Fast EBAC profile for alignment and navigation
- Simultaneous SE/EBAC profile for localization
- High resolution EBAC profile for mapping and analysis

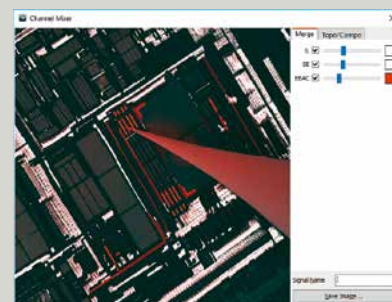


Signal monitor tool assists image acquisition and calibration

- Live signals are displayed as line scans or level meters
- Multiple live signals are displayed simultaneously
- Display of shadowed areas is optimised with a gradation graph tool

Advanced EBAC modes include biased operation, beam current output and calibration

- Voltage bias is also used for voltage contrast
- Bias is DC and includes current compensation
- All amplifier settings can be saved and reloaded



Detailed technical specifications

■ EBAC/RCI pre-amplifier module

Gain	10 ⁷ V/A fixed
Bias voltage	-10 ... 10 V, 16-bit
Mount	Mounted in situ on the SEM sample stage
Board type	Standard PCB

■ EBAC/RCI amplifier module

Hardware interface	USB 2.0
Gain/contrast	0.1 ... 100x
Brightness	-1 ... 1 V, 16-bit
Low-pass filter	8 levels
DC-signal suppression	16-bit
Beam current input	Switchable internal or external input
Video signal inversion	Yes
Beam blanker output	Yes

■ EBAC/RCI and SEM acquisition module (DISS 5 EBAC/RCI)

Hardware interface	USB 2.0
Simultaneous inputs (i.e. SE, BSE)	4x, 12-bit
Mapping signals (i.e. EDS)	12x, 16-bit
Scanning interface	Pre-configured for SEM and analytical add-ons
Synchronization interface	Pixel, line, frame
Scan size	16,384 x 16,384 pixels max.
Pixel dwell time	200 ns ... 6 milliseconds
Pixel over-sampling	32,000x max.
Line averaging	50x max.
Frame averaging	256x max.
Synchronization	mains power
ROI scan	Yes

■ Electrical holder

Contacting probes	2x
Contacting geometries	1 top probe and 1 bottom plate 2 top probes
Imaging geometry	Plan-view and cross-section
Faraday cage	Yes
Maximum sample size	25 mm x 50 mm
Holder height	20 mm

EBAC/RCI

■ PC/Laptop, Display

PC/Laptop	Intel Core i3 minimum 2x USB 2.0 minimum
Displays	1,280 x 1,024 resolution minimum
Operating systems	Windows 10 ... Windows XP Network connection recommended

■ Acquisition software (DISS 5 EBAC/RCI)

EBAC/RCI control	Complete software integration
EBAC/RCI operation modes	Standard, Biased, Calibration, Beam Measurement
EBAC/RCI configuration	Complete profile save/load
EBAC/RCI inspector	Quantified live current reading
Current voltage (IV) tool	Configurable, with graph and data export
SEM mag, kV information	Automated SEM communication
Image mixing tool	Colour assignment and live mixing
Scan profiles	Yes
Signal monitor	Yes
Software API	Yes
Image caption overlay	Yes
Default file formats	8 and 16-bit multi-page TIFF
Export file formats	BMP, JPEG, PNG, GIF
Context sensitive help	English, German

■ Analysis software (DIPS 5)

Current quantification	Automated data quantification
Magnification/scale information	Automated scale management
Image caption overlay	Configurable live and image export overlays
Image information display	All relevant acquisition parameters
Image mix (SE, EBAC/RCI, ...)	Configurable colour assignment
Editable LUT (look up table)	False colour, GGR file format
Pseudo-surface view	Pan, zoom, rotation, tilt, lighting modes
Distance, area measurements	Live display
Line profile extraction	Multiple lines, synchronised SE, EBAC
Operating system	Windows 10 ... Windows XP
Context sensitive help	English, German

■ Parts and Cables

EBAC/RCI in situ pre-amplifier module	Standard	1x
EBAC/RCI ex situ amplifier module	Standard	1x
EBAC & SEM acquisition module (DISS 5 EBAC)	Standard	1x
EBAC/RCI pre-amplifier power supply	Standard	1x
EBAC/RCI amplifier power supply	Standard	1x
EBAC/RCI vacuum feedtrough	Optional	1x
EBAC/RCI in situ mixed signal & power cable	Standard	1x
EBAC/RCI ex situ mixed signal & power cable	Standard	1x
EBAC/RCI ground strap	Standard	1x
EBAC & SEM mixed control & acquisition cable	Standard	1x
USB cables	Standard	2x
USB memory stick	Standard	1x
PC, keyboard, mouse	Optional	1x
Displays	Optional	1x

■ Software packages

EBAC/RCI acquisition USB driver	EBAC RCI Amplifier
SEM acquisition USB driver	Digital Image Scanning System 5
Acquisition software	DISS 5
Analysis software	DIPS 5

■ Weight and Dimensions

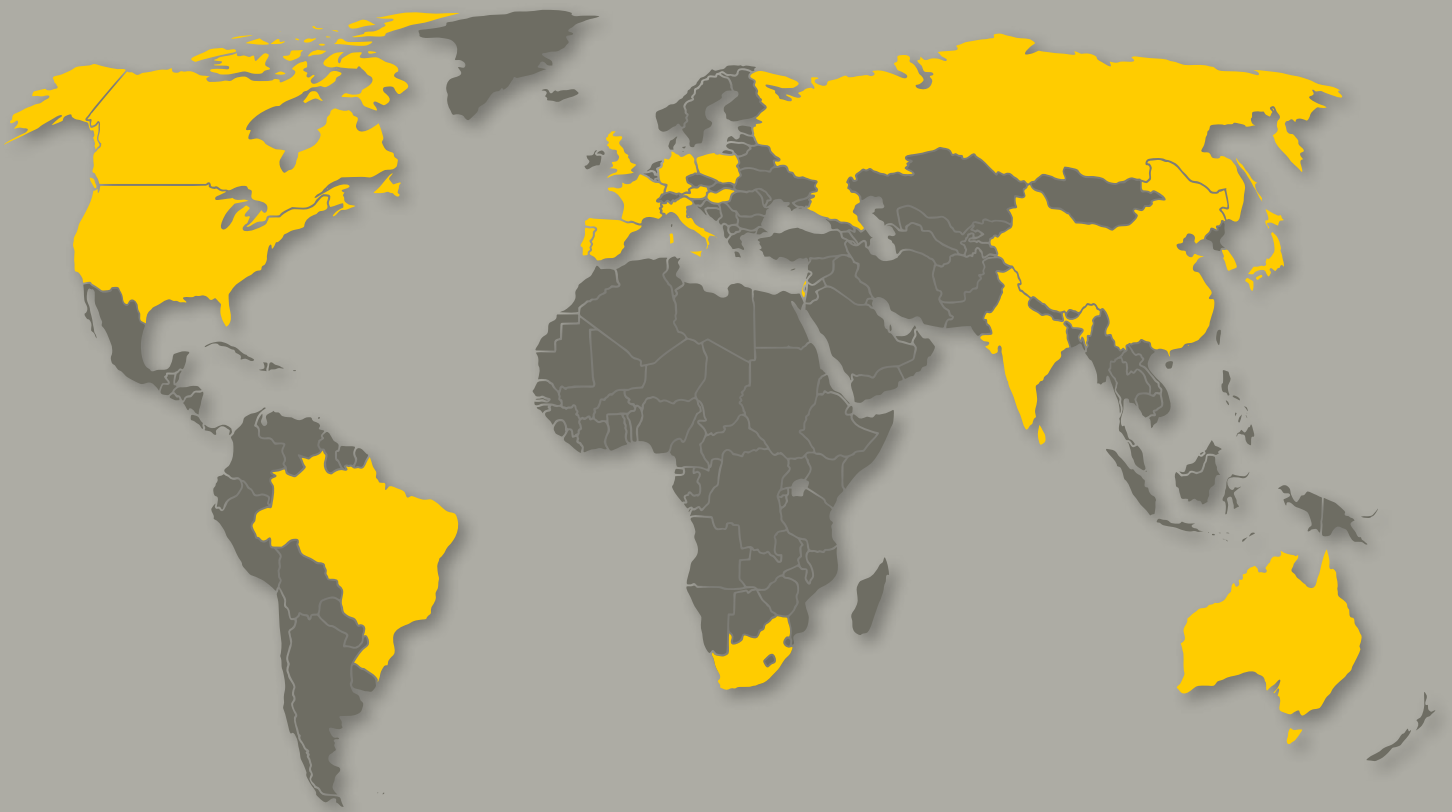
EBAC/RCI amp. module dimensions	25 x 10.5 x 6 cm typ.
EBAC/RCI amp. module weight	1,2 kg typ.
EBAC/RCI power supply dimensions	17.5 x 11 5.5 cm
EBAC/RCI power supply weight	1.2 kg
DISS5 module dimensions	23.5 x 8.7 x 29.5 cm
DISS5 module weight	3.4 kg
Shipping dimensions	typ. 36 x 32 x 56 cm
Shipping weight	typ. 7.5 kg

■ Site requirements

Power	2x mains 110/220 VAC single phase 50-60 Hz on the same earth as the microscope
Microscope	2x in situ connections to device under test 1x mixed power and signal vacuum feedtrough for pre-amplifier 1x SEM earth connection 1x mixed scan interface and SEM signals connection
Space	EBAC/RCI pre-amplifier must be placed inside the SEM chamber EBAC/RCI amplifier must be placed in the proximity of SEM chamber Power supplies may be placed on the floor DISS5 box may be placed on the SEM bench



EBAC/RCI



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