Electrical Analysis for SEM
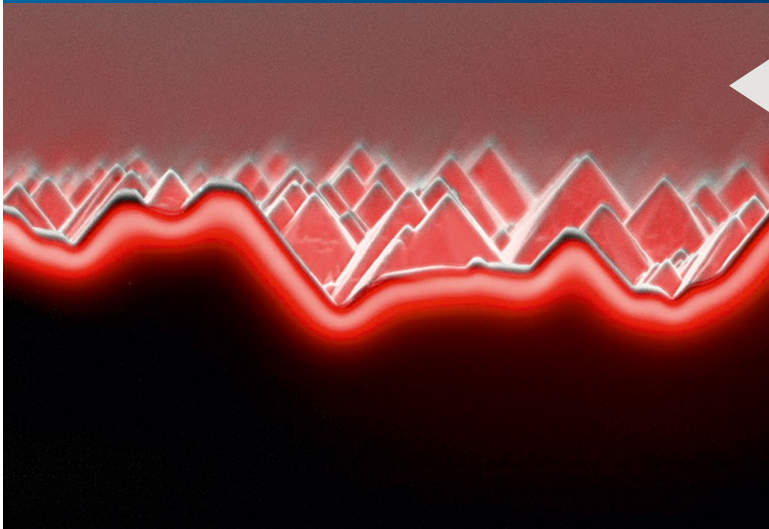
The best quantitative electronics and software for analysis of electrical properties in SEM and FIB/SEM

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Explore electrical properties at the microscale


Reveal internal electric fields

- Map active areas of junctions and contacts
- Validate doping profiles against design or model
- View electrical behaviour under bias
- Export data for quantification of diffusion length

Discover electrical activity of defects

- Localise sites with increased recombination activity
- Continue with high-resolution microscopy techniques
- Export data for quantification of recombination strenght
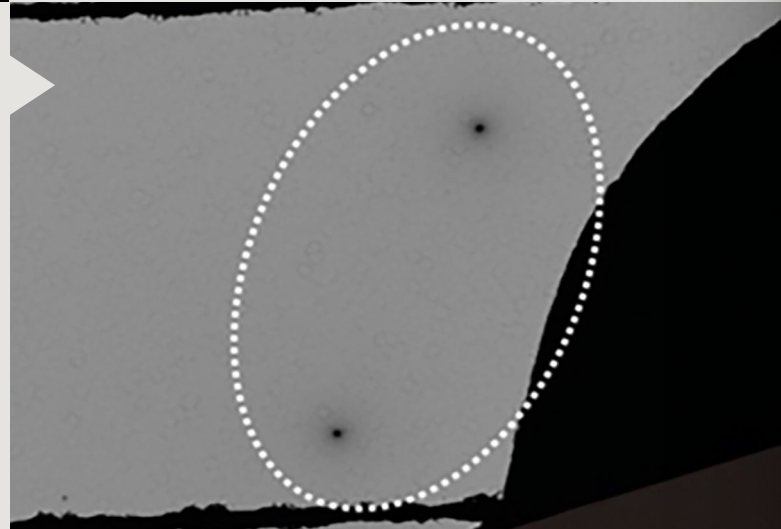
Apply a wide range of techniques

- Electron Beam Induced Current (EBIC)
- Electron Beam Absorbed Current (EBAC)
- Resistive Contrast Imaging (EBAC/RCI)
- Electron Beam Induced Resistance Change (EBIRCh)
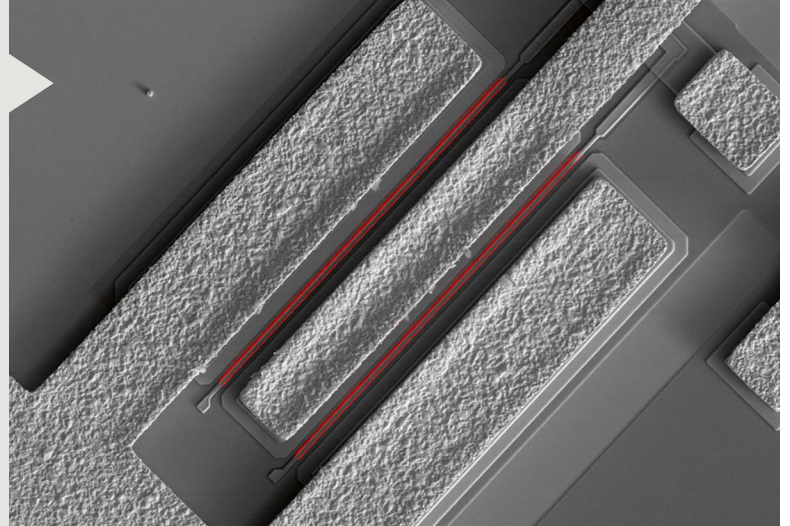
Map resistance/conductivity

- Map spatial distribution of electrical resistance
- Identify shorts and opens in devices
- Localise weaknesses and leakage paths
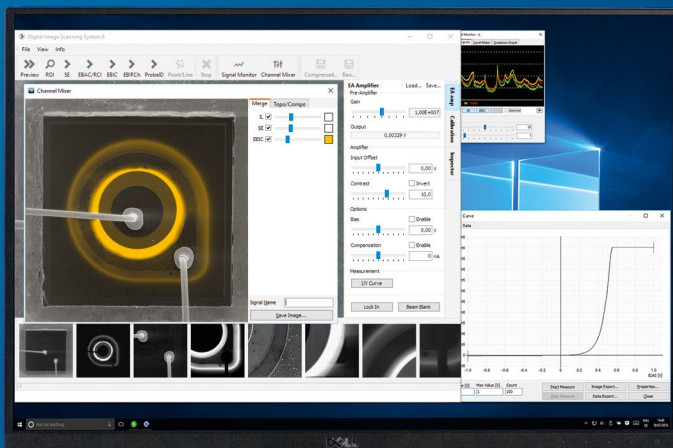
EA for SEM

Enable lamella preparation for TEM

- Exploit wide field-of-view in SEM to select target
- Use EA live in FIB/SEM to prevent preparation errors
- Screen lamellas in SEM before transfer to TEM
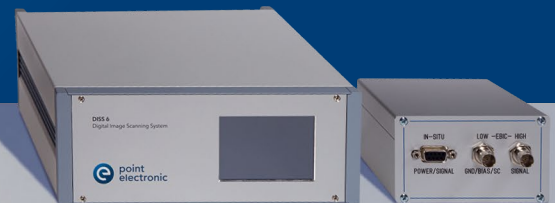
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The best quantitative EA system for SEM

Electronics are fully integrated and software controlled

- Fast amplification optimised for imaging
- Wide gain range to fit all techniques
- In-situ pream for low impedance*
- Range of sample holders*
- Reference samples for training*

* optional

EA amplifier for SEM

- Two stage amplification for maximum range
- Built-in voltage bias and current compensation
- Factory calibrated gains and offsets
- Optional lock-in configuration

EA DISS6 imaging

- Integrated scan generator and image acquisition
- Very large resolution and very fast speed
- High bit depth EA analog-to-digital conversion
- Simultaneous SEM and EA inputs
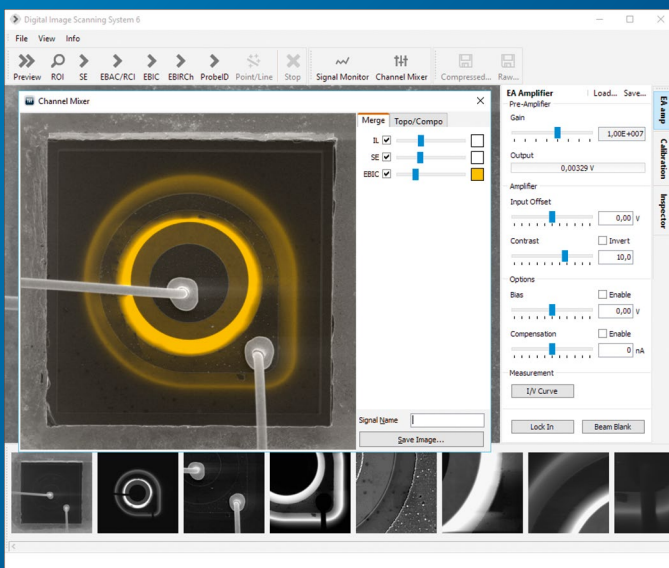
EA for SEM

EA sample holders

- Compatible with a range of SEM stages
- Built-in Faraday cups for beam current measurements
- Optional in-situ preamplifier for low impedance devices
- Optional load-lock configuration

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The highest level of integration and automation

## DISS6 - control and acquisition app

- EA amplifier control
- EA and SEM image acquisition
- Automatic quantification to µA...fA
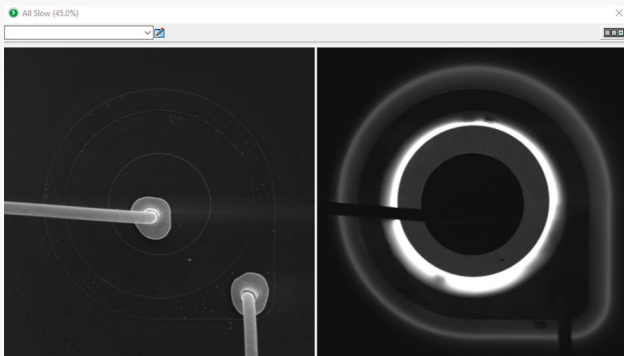- Current-voltage sweep tool
- Live image mix tool
- Standard file formats

DIPS6 - processing app

- Full image and metadata viewer
- Automatic quantification to µA...fA
- Gradient-based pseudocolours
- Colour mix of pages for visualisation
- Export of quantitative pixel values
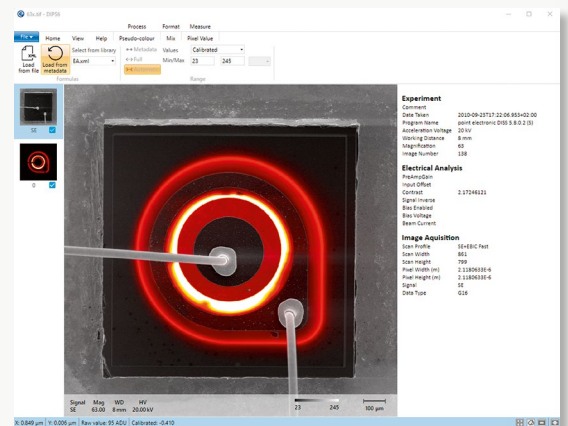
Configurable workflow with scan profiles

- Fast scan EA profile for alignment and navigation
- High resolution EA profile for mapping and analysis
- Simultaneous EA/SE scan profile for localization
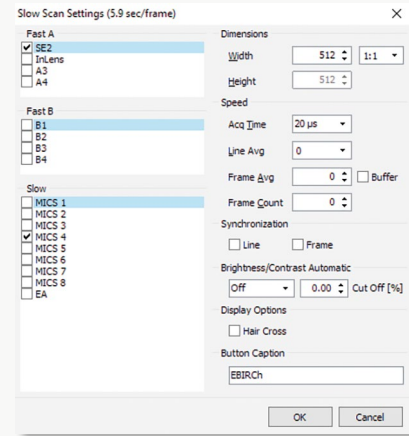
Direct correlation with simultaneous imaging

- EA plus another 4 simultaneous signals
- Automatic display range
- Live colour mixing tool for visualisation

EA for SEM

Integrated current-voltage sweep tool

- Configurable range, points and measure time
- Verify electrical connections to device
- Inspect for electron beam damage

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EA amplifier for SEM

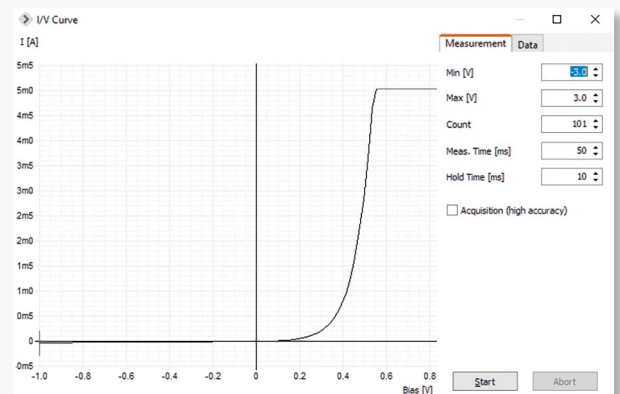|	
Inputs	1x BNC for EA high (sense)
	1x BNC for EA low (switchable ground or bias)
Pre-amplifier(s)	$10^3 \ldots 10^{10}$ V/A variable **ex-situ gain**
	10^7 V/A fixed in-situ gain (optional)
	0.5 MHz bandwidth at 10^9 V/A
Main amplifier	0.1 … 100x, 16-bit contrast
	0…1 V, 16-bit brigthness
	Analog signal inversion
	8 levels low-pass filter
	manual zero/dark correction
Internal sources	-10 … 10 V, 16-bit bias voltage
	-10 … 10 µA, 16-bit compensation current
Outputs	1x BNC for amplified signal
	1x D-SUB for in-situ preamplifier power

EA DISS6 imaging

Signal inputs	1x calibrated EA
	4x calibrated SEM
Digitization	16-bit EA
	12-bit SEM, saved to 16-bit
	32,000× max. oversampling (pixel averaging)
Scan generator	X and Y scan outputs (calibrated)
	beam blank output (optional)
	64k × 64k pixels maximum resolution
	0.5 GPixels maximum frame size (software limit)
	1 µs minimum pixel dwell time (EA input limit)
	6 milliseconds maximum pixel dwell time
	256× max. frame average
	50x max. line average
	frame, line, pixel synchronization (optional)

EA sample holder

Configurations	2x probes
	4x probes
	4x probes with in-situ preamp
	4x probes for load-lock transfer
Faraday cage	Standard
Flange with feedtrough	Optional

PC/Laptop, Display

PC/Laptop	Intel Core i3 minimum
	2x USB 2.0 minimum
Display	1,280 x 1,024 resolution minimum
Operating systems	Windows 11 … 7
	Network recommended for remote support

DISS6 app

EA amplifier control	Gain, Contrast, Brightness, Bias, Compensation, Inv.
	Save/load amplifier profile
EA DISS6 imaging control	Configurable scan profiles
	Signals, pixel size, speed, averaging, sync
	Manual/automatic image range
Inspector tool	Automatic quantification of pixel values
	Editable formula files
Current voltage (IV) tool	Voltage range, steps, time
	Live plot with data export
Image mixing tool	Manual colour assignment
	Live mix with image export
Save file formats	uncompressed 8-bit or 16-bit multi-page TIF
	compressed JPEG
	XMP metadata embedded into TIF and JPEG
Operating systems	Windows 11 … 7

DIPS6 app

Input file formats	uncompressed 8-bit or 16-bit multi-page TIF
	compressed JPEG
	XMP metadata embedded into TIF and JPEG
Export file formats	PNG images
	CSV data with pixel values
View modes	Single page image and metadata
	Multiple pages/file
	Layers/image mix view
Quantification	Automatic, using XMP values and formulas
	Manual, using XML formulas
Pseudo-colour	GGR gradient based colour mapping
	Automatic and manual control of range
Operating systems	Windows 11 … 7

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Parts and Cables

EA amplifier for SEM	Standard	1x
EA DISS6 imaging	Standard	1x
EA power supply	Standard	1x
EA ground strap	Standard	1x
EA signal cable	Standard	1x
SEM external scan interface cable	Standard	1x
USB cables	Standard	2x
USB memory stick with software	Standard	1x
EA reference samples	Optional	-
EA sample holders	Optional	-
Flange with feedtrough	Optional	-
PC, keyboard, mouse	Optional	1x
Display	Optional	1x

Software packages

Drivers	PEUSB
Libraries	DISS6Control
Apps	DISS6 app
	DIPS6 app
Server	EMGateway

Weight & Dimensions

EA amplifier	10.5 x 6.0 x 25.0 cm typ.
	1.1 kg typ.
EA power supply	11.0 x 5.5 x 17 cm
	1.2 kg
EA DISS6 imaging	23.5 x 8.7 x 29.5 cm
	3.4 kg
Shipping	typ. 36 x 32 x 56 cm
	typ. 7.5 kg

Site requirements

Power	1x mains 110/220 VAC single phase 50-60 Hz
	on the same earth as the microscope
Microscope	1x vacuum electrical feedtrough to device under test
	1x connection to SEM earth
	1x mixed scan interface and SEM signals connection
Space	EA amplifier must be placed in the proximity of SEM chamber
	EA power supply may be placed on the floor
	EA DISS6 imager may be placed on the SEM bench
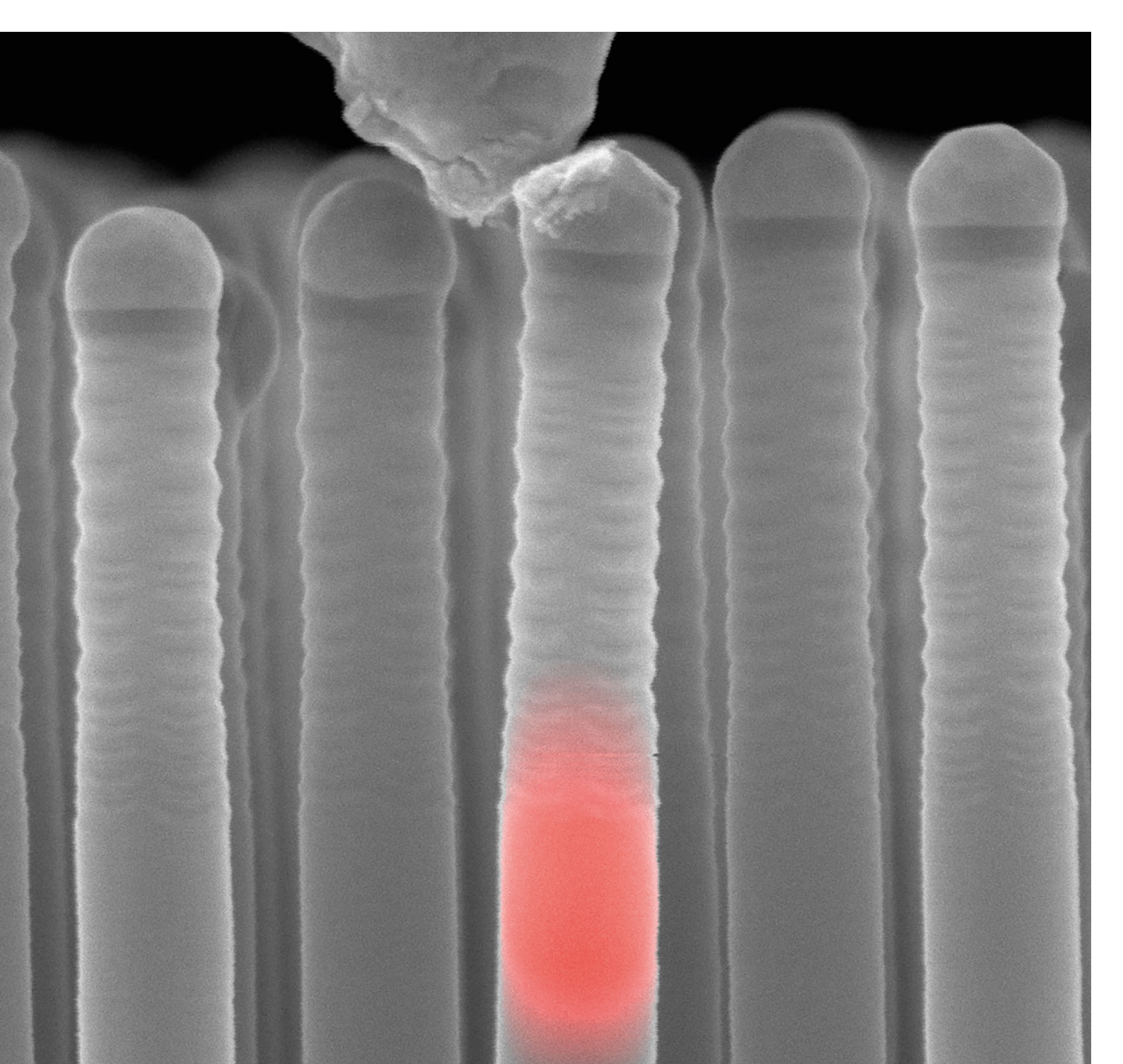
EA for SEM
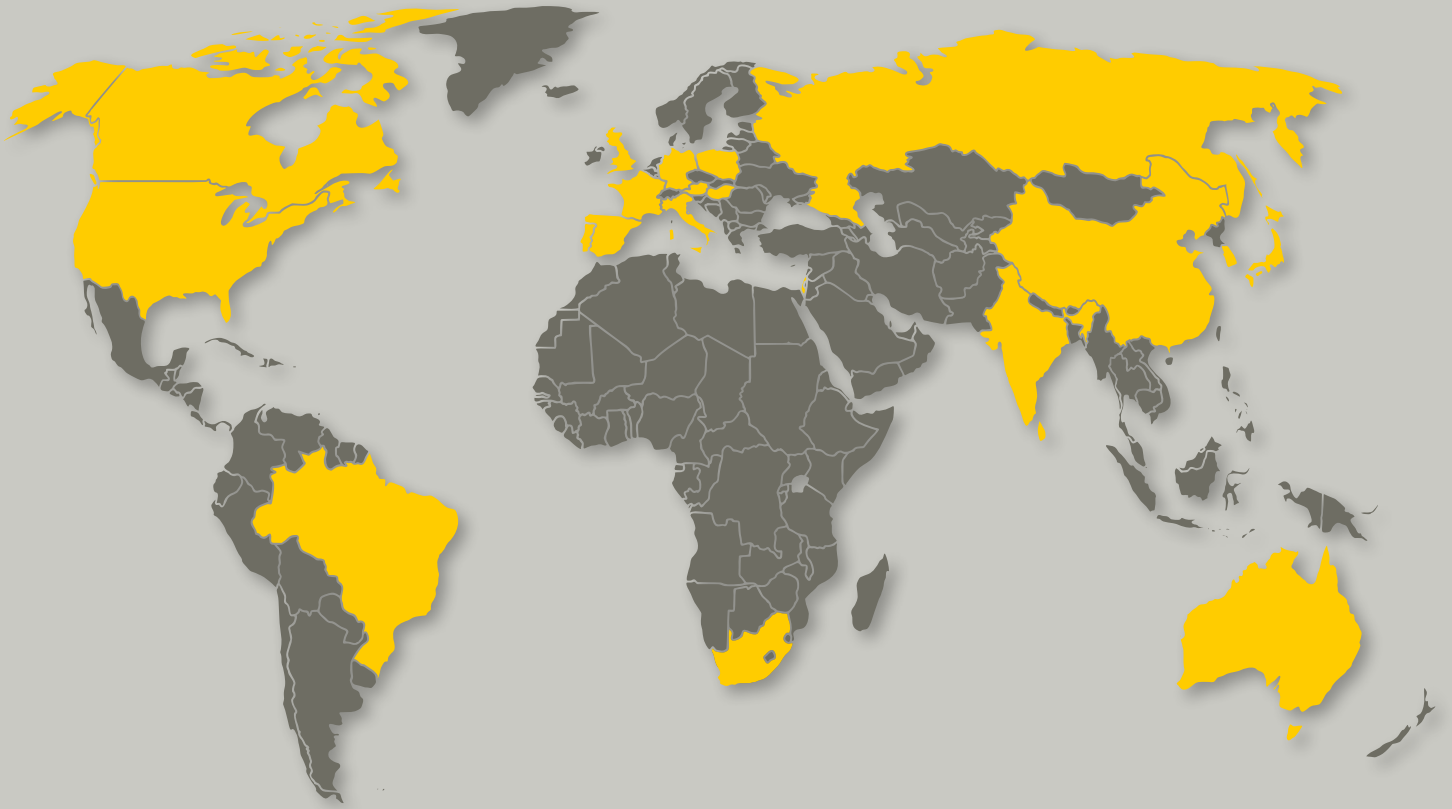
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