



Product Portfolio

RA **RAITH**
NANOFABRICATION

EBPG5200 EBPG5150



Select first-choice evolutionary technology

EBPG5200 / EBPG5150 – Ultra high performance Electron Beam Lithography

The latest EBPG series system is a further evolutionary progression of many years of system development. The EBPG system has a well-established industrial user base in the manufacture of compound semiconductors and is the system of choice in many of the world's leading universities and centers of excellence for nanotechnology research.

With its high resolution, stability and large field size operation, it provides customers with a stable working platform for the development of next-generation devices. The modular system architecture allows the adaptation of the system configuration to specific customer requirements along with a structured upgrade strategy, providing a path for tracking future technology trends as well as protecting the customer's initial system investment.

Where higher throughputs are required for specialized industrial markets, the ability to deliver higher current density, fast 100 MHz pattern generator/deflection and stage operation single out the EBPG series as offering the highest throughput in its class.

Main Applications

- High kV lithography
- High-speed direct write
- Batch production: e.g. compound semiconductor devices
- Anti-counterfeiting security elements

Column Technology

- EBPG
- Electron
- 100 kV

Stage

- EBPG5150:**
 - 6" Stage
- EBPG5200:**
 - 8" Stage
 - Optional Z lift
- EBPG series:**
 - Optional 2 or 10 holder

VOYAGER



Speed up! – Fast, smart, innovative and economical

VOYAGER – a new class of Electron Beam Lithography technology

VOYAGER™ is recommended for all industrial and academic Electron Beam Lithography applications where the important objectives are high write throughput and high-resolution. As well as the newly developed, innovative eWRITE system architecture, Raith attaches great importance to an attractive price/performance ratio throughout the lifetime of the system.

The hardware and software have been consistently designed for automated exposure operations. The state-of-the-art high-performance pattern generator and electron optics have been optimally aligned.

Samples of up to 8 inches are exposed at high speed. The necessary system stability is ensured, even in difficult environments, by a thermally stabilized and environmentally tolerant housing.

Main Applications

- Nanolithography
- High speed direct write
- Diffractive optical elements
- Anti-counterfeiting security elements
- Small-batch compound semiconductor devices manufacturing

Column Technology

- eWrite
- Electron
- 50 kV
- High-speed ET SE detector and high-speed post-lens BSE detector

Stage

- 6" full travel
- Large Z travel

RAITH150 Two



Bridge your technology needs

RAITH150 Two – Raith’s environmentally tolerant, ultra-high resolution direct write system

Since its introduction, the RAITH150 Two has established itself as a bestseller among universal, high resolution Electron Beam Lithography systems. It is used in research centers and nanotechnology centers worldwide.

RAITH150 Two exposes structures smaller than 5 nm. Process operation and documentation is enabled by outstanding scanning electron microscope (SEM) properties. RAITH150 Two works with sample sizes from a few mm to 8-inch silicon wafers.

The system stability, even in difficult environments, required for demanding exposures is made possible by a thermally stabilized and environmentally tolerant housing.

Main Applications

- Nanolithography
- Imaging
- Low-voltage EBL
- Large-area SEM image acquisition, sample navigation, metrology

Column Technology

- Gemini
- Electron
- 30 kV
- ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector

Stage

- 6" full travel
- Large Z travel



FIB nanofabrication at its excellence

ionLINE Plus – FIB meets LITHO

High-resolution and versatile nanofabrication employs advanced FIB techniques with lithography instrumentation.

ionLINE Plus breaks new ground for your nanofabrication challenges by realizing the synergy of a focused ion beam with mature lithography architecture. It combines direct FIB processing techniques with the unrivaled stability, automation, and high resolution of a lithography instrument. Featuring the latest-generation ion column, pattern generator, and software platform, ionLINE Plus offers unique capabilities for advanced FIB nanofabrication.

FIB techniques can make nanofabrication more efficient by employing direct patterning (milling, deposition, etching) or hard masking. Moreover, IONselect technology offers a range of ions with excellent handling, opening the door for various nanofabrication techniques yet to be explored. It also supports processing by surface functionalization or maskless ion implantation, paving the way for new breakthroughs in next-generation research.

Finally, a range of options for extended functionalities like *in-situ* gas injection, nanoprobe or nanoprofilometry enhance the versatility of ionLINE Plus, while its highly configurable chamber and upgrade paths ensure the tool is future proof.

Main Applications

- Direct and 3D nanofabrication
- Nanolithography
- Deposition and Gas Assisted Etching
- Nanoengineering platform
- Ga-free nanofabrication

Column Technology

- nanoFIB™ Three
- Ion Ga (Au, Si, Ge)
- 35 kV
- IONselect

Stage

- 4" full travel
- Large Z travel
- Rotation and tilt sample holder

eLINE Plus



Discover nanoengineering beyond Electron Beam Lithography

eLINE Plus – the swiss army knife for nano-fabrication

eLINE Plus™ is the optimum, widely distributed system for universities and research centers that want to combine an efficient and uncompromising Electron Beam Lithography system with an open platform for further nanofabrication processes and techniques.

In order to be prepared for the broadest bandwidth of applications, modern nanotechnology research today requires multiple techniques beyond classic and pure Electron Beam Lithography (EBL) – preferentially *in-situ*.

In addition to fully integrated nanomanipulators and a mechanism for electron beam induced deposition and etching, a range of further options is available that identifies eLINE Plus as currently the most versatile and unique nanoengineering EBL system.

Main Applications

- Nanolithography
- (Large-area) SEM image acquisition, sample navigation, metrology
- Focused Electron Beam Induced Processes (FEBIP)
- Nanoprobng, nanomanipulation, nanoprofilometry
- Material and structural analysis
- Customized applications using open platform concept

Column Technology

- Gemini
- Electron
- 30 kV
- ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector

Stage

- 4" full travel
- Large Z travel
- Rotation and tilt sample holder (option)

PIONEER Two



Best of both worlds: Direct write and direct view

PIONEER Two – top technology for the best of both worlds: EBL and imaging in a single system

PIONEER Two™ is the ideal solution for all universities and scientists with equal requirements for both an Electron Beam Lithography system and an analytical Scanning Electron Microscope for imaging purposes.

PIONEER Two, as an ideal EBL-SEM hybrid, integrates all ingredients for professional EBL and SEM into one complete turnkey system. The system stands for almost unlimited bandwidth of nanolithography, imaging and analytical applications.

The system architecture has been designed and developed with particular consideration of given research budgets in university environments. At the same time, PIONEER Two delivers guaranteed EBL performance in linewidth, stitching and overlay.

Main Applications

- Nanolithography
- SEM imaging
- Material and structural analysis
- Large-area SEM image acquisition, sample navigation, metrology

Column Technology

- Gemini
- Electron
- 30 kV
- ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector

Stage

- 2" full travel
- Large Z travel
- Full rotation and tilt integrated (option)

ELPHY



Unlock the full nanopatterning potential of your SEM, FIB-SEM, or HIM

ELPHY – the easiest and most economical access to professional nanolithography and nanofabrication

Raith offers the ELPHY™ product family, a nanolithography upgrade kit, that enables scanning electron microscopes (SEMs), focused ion beam microscopes (FIBs), helium ion microscopes (HIMs), or combined systems (FIB-SEMs) to deliver professional nanolithography applications.

This spectrum of solutions begins with ELPHY Quantum, the most widely distributed Raith SEM/FIB attachment in the market. The entire range of processes (CAD layout and processing, control of exposure parameters, remote control of each microscope etc.) is integrated within a single user interface, the Raith NanoSuite. The specially developed hardware is supplied on Windows-based PCs.

ELPHY Plus was developed for more demanding applications or on field-emission SEMs with higher current density and in connection with a Laser Interferometer Controlled Sample Stage. A well-engineered and fast pattern generator hardware delivers the required performance.

Raith has set new standards in the market for nanolithographic solutions (“Attachments”) with ELPHY MultiBeam. The ELPHY MultiBeam combines the latest technology for three-dimensional IBL and other 3D nanofabrication techniques with the very best EBL performance, and helps to exploit the full nanofabrication potential of any FIB-SEM or FIB system.

Main Applications

- Nanolithography
- SEM lithography
- FIB-SEM lithography and nanopatterning
- Helium Ion Microscopy – HIM-lithography and nanopatterning
- (3D) nanoprototyping
- Attach to analytical SEM, FIB-SEM, FIB, HIM supplier instrumentation

Stage

- Standard stage delivered by analytical SEM, FIB-SEM, FIB, HIM supplier

CHIPSCANNER



True large-area image acquisition

CHIPSCANNER – the Raith solution for chip design recovery, layout reconstruction, anti-counterfeiting, and IP protection

For reverse engineering applications, cm²-large chip areas need to be scanned with nm resolution and excellent layer-to-layer accuracy ('3D stitching') for layout and schematic extraction.

CHIPSCANNER delivers the necessary performance for this demanding operation. CHIPSCANNER uniquely combines high-resolution electron optics, multiple, highly efficient electron detectors and most precise laser interferometer stage technology.

Calibrated image scans of up to 50,000 x 50,000 pixels reduce the number of images and seams while retaining smallest pixel sizes. Height-sensor-based focus correction, sample preleveling technologies and built-in temperature stabilization deliver homogenous large-area image mosaics with smallest stitching errors and stable brightness/contrast values.

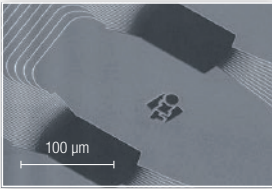
Depending on the selected stage travel range, several samples can be loaded and image mosaics can automatically be acquired without user interaction.

Software tools are available to extract and optimize valuable GD-SII-CAD data from the images for further processing.

Main Applications	Column Technology	Stage
<ul style="list-style-type: none"> • Chip design recovery • Layout reconstruction • Anti-counterfeiting analysis • IP protection • Chip obsolescence management • Large-area SEM image acquisition, sample navigation, metrology 	<ul style="list-style-type: none"> • Gemini • Electron • 30 kV • ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector 	<ul style="list-style-type: none"> • 2" - 6" (8" wafer loading)

traxx & periodixx

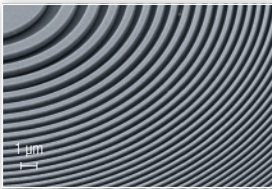
The stitching-error-free lithography options traxx and periodixx are available for many of the Raith products. These have been developed for the purpose of performing nanolithographic exposures without stitching errors that are inherent to every step and repeat exposure technique. traxx and periodixx are available for eLINE Plus, ionLINE Plus, RAITH150 Two and VOYAGER.



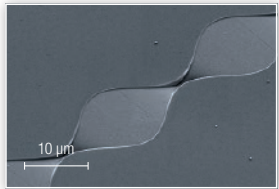
Stitching-error-free fabrication of nano-photonic components on SOI with traxx
R. Schmits, TNO Technical Sciences, Delft, Netherlands

Application areas

With its range of solutions, Raith operates in all areas where nano-structures are deployed as indispensable components of products and technologies. Such systems could be in quantum physics, materials science, nanobiotechnology, nanoelectronics or nanomedicine. Some of the largest areas of application are in semiconductor technology, for example, and in information and data storage technology.



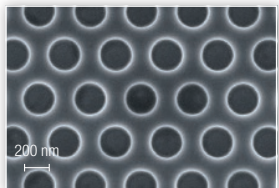
X-ray zone plate in 500 nm thick gold
Max-Planck-Institute Stuttgart, Germany



FIB 3D stitching
A. Nadzeyka, Raith GmbH, Germany



EBID fabricated nano chess pieces
A. Linden, Raith GmbH, Germany



Photonic crystals written with FLEXposure mode in ZEP520a
Prof. Thomas Krauss, University of York, UK



About Raith

Raith is a leading precision technology manufacturer for electron and ion beam lithography, nanofabrication, nanoengineering and reverse engineering. The company offers solutions for researchers and engineers in both academic and industry settings.

Founded in 1980 and headquartered in Dortmund, Germany, Raith employs around 200 people. The company works as closely as possible with customers in the most important global markets through subsidiaries in the Netherlands, the USA and Asia, and through an extensive partner and service network.

In February 2013, Raith joined forces with Vistec Gaussian Beam Lithography, another leading lithography equipment manufacturer with more than 45 years of experience. With this ideal extension to the product portfolio, customers now are able to select from a comprehensive range of nanofabrication systems.

Raith customers benefit from innovative, intelligently configured high-tech systems at an excellent price-performance ratio. With the world's largest service and support infrastructure in the area of nanofabrication, the world's greatest customer community, and highly trained personnel, customers can be sure of making a solid investment with the company.

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