

### Automated Pattern & Process Metrology

Advanced SEM metrology and automation software package for image analysis of lithographic patterns or micro and nanostructures

## "Pro" Your SEM!



www.genisys-gmbh.com

Lithography tools (electron or laser beam and optical) combined with additional data preparation and process improvement techniques are highly optimized and automated for the patterning of micro and nanostructures.

However, SEM based metrology and process monitoring are manual and highly tedious to perform. Nowadays R&D institutions, multi-user facilities, and specialized small-batch manufacturing companies call for easy, automated, and reliable measurements – which **ProSEM** does provide.

### VERSATILE

Easy and optimized for micro and nanofabrication

Precise and calibrated SEM image

Repeatable results and large data sets

Layout design and application flexibility





#### PRODUCTIVE

CONSISTENT

analysis

- Automated image acquisition and processing
- Layout-based metrology and batch recipes





### **ProSEM**

Automation, performance and precision that SEM metrology and process monitoring deserve

## "Pro" Your SEM!

#### Algorithm-based Easy Metrology

**ProSEM** comes with a clean user interface and is organized in projects. Loading images with metadata gives correct scaling, while additional calibrations for improved precision are possible. Advanced edge detection and feature fitting algorithms ensure simplicity and accuracy. **ProSEM** supports both conventional CMOS structures as well as a variety of element types used in R&D or specialized applications. Results can be visualized with images, as 1-D line scans, and PSD plots with complete data analysis, reporting, and export.



#### **Advanced Pattern & Batch Processing**

For repeating similar or rotated/scaled structures, the automatic feature find can measure large numbers of elements and provide detailed statistical reports for gratings and arrays. Moreover, recipes can be defined and process large image sets in batch mode. **ProSEM** with advanced functionality like "segmented contour" can handle more complex 2-D and open structures. For instance, sophisticated calculations with line and arc segments can be applied to tip/ rounding or cross-section measurements.



#### Aligned CAD Layout Integration

**ProSEM** also offers the ability to view multi-layer designs based on CAD layout integration. This can be used to define regions of interest along with the metrology settings. Images in the project are

then registered to the preset measurements. Complex metrology jobs can be created and automatically give all measurement results, with the layout additionally overlaid on the images.



#### **Digital Interface SEM Automation**

The full automation package of **ProSEM** additionally includes control for automated SEM image acquisition via a digital interface. After alignment of layout and stage coordinates, the extended version of the

measurement list triggers a sequence of SEM stage drives and image scans. With loading the set of images and an automatic assignment, all results are directly provided for the preset measurements.





#### Edge Detection & **Contour Extraction**

- Sigmoidal Fit
- Baseline Regression
- Parabolic Peak Fit
- Correlation-based
- Rising/falling edges

#### Elements & Measurements

- Lines/Spaces
- Circles, Ellipses
- Rectangles, Triangles
- Arbitrary Shapes Multi-edge

#### **Batch Processing**

- Recipe handling
- Export and import
- User variables
- Advanced data analysis
- Plotting/reporting

#### **Results & Data Handling**

- Results/summary tables
- User variables, formulas
- Python scripting
- Export CSV and GDS
- LER and PSD (1-D and 2-D)

#### **Platform support**

- Windows: 10/11, 64-bit
- Redhat/Centos Linux: 7 or 8, 64-bit
- Ubuntu Linux: 18.04 or 20.04, 64-bit



#### **Array Measurements**

- Find similar/modified
- Gratings Rectangular arrays
- Hexagonal arrays
- Random distribution

#### **Advanced Contours**

- Correlation-based 2D
- Line and arc segments
- Settings per segment
- Complex calculations



#### **Layout Formats**

- GDS DXF
- LEDB
- OASIS
- CIF

#### Metrology support

- Lines/Spaces
- Circles, Ellipses
- Rectangles
- Auto polarity function
- Register with reference image from layout snip



#### Main features of SEM automated metrology

- Support of common SEM interfaces
- 3-point alignment of layout to sample coordinates
- Definition of combined automation & measurement list
- Automated acquisition of SEM images through ProSEM
- Automatic assignment and measurement after loading
- License at SEM and offline (PC setup on request)

# "Pro" Your SEM!

#### Algorithm-based Easy Metrology

- Organized user interface with projects
- Handling of images and meta data
- Additional calibration methods
- Advanced edge fitting algorithms
- Various element feature types
- Image visualization, line scan, PSD plot
- Statistical results and reporting





**Aligned CAD** 

Layout Integration

- Automatic feature find
- Measure similar or rotated/scaled features
- Fitting and measurement of arrays
- Recipe definition for batch mode
- Processing of images and projects
- Feature type "segmented contours"
- For X-sections and complex 2D tasks

Load and view multi-layer designsDisplay parallel to image view

Registration of images to layout designLayout and metrology overlay on image

Define metrology on layout





#### Digital Interface SEM Automation

- Digital interface to control SEM tool
- Alignment of layout and sample
- Measurement list with image scan locations
- Automated acquisition of SEM images
- Loading of images to obtain results directly
- Combined work at SEM and offline







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Based in Munich (Germany) with offices in Japan and USA, GenISys serves markets in lithography and inspection with flexible, high-performance software solutions for the optimization of micro and nano fabrication as well as metrology and inspection. GenISys combines deep technical expertise in layout data processing, lithography process modeling, correction and optimization, physics-based simulation, image analysis, and measurement algorithms with world class software engineering.

With a strong focus on ease of use and application requirements, GenISys products give engineers, manufacturers, and tool suppliers unparalleled efficiency and optimal value in research, development, and production of future nano technologies. As a customer driven company, **GenISys** delivers fast, highly dedicated support for development and application of advanced functionality to meet demanding customer needs. application of advanced functionality to meet demanding customer needs.