

# Automation

## Wafer/panel handler EFEM

Combine a Sigma W12 wafer bond tester with various Equipment Front End Module (EFEM) platforms for operator free wafer/panel (un)loading and testing of wafers up to 300 mm.



## Pick and place loader for waffle trays

With a waffle tray loader on a Sigma MAG, you can easily pick samples from the waffle tray and place samples into the work holder and vice versa.



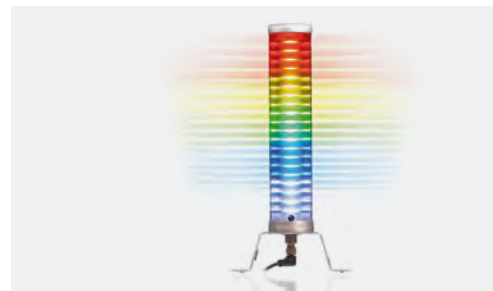
## Magazine loader for lead frames

Add an independent lead frame (un)loader for hands-free bond testing of multiple types of lead frames, cassettes, magazines, PCBs, flex, and boat carriers.



## Visual feedback

Programmable stack lights allow you to work efficiently and to manage multiple systems simultaneously.



### Loading



Robotic handlers



Easy programming



Smart vision cameras



Tool alignment



Fiducials recognition



Wire detection

### Testing



Grading run



Auto grading



Image measurement (AOI)



Data communication

### Analyzing

# Automation

## Easy programming



The open Sigma software enables easy programming of total automation steps, positions, and commands. The automation editor employs camera visualization and intelligent wizards.

Other optional solutions to minimize human errors:

- **Barcode reader**  
Quickly start a test sequence using a 2D barcode reader. An automation, test method, or form starts automatically after scanning the QR code or barcode.
- **Matrix selection**
- **Substrate map import**

## Smart vision



See the unseen with up to 3 live cameras. Bring out the features of interest with images or video using high-resolution cameras, flexible LED illumination, and fantastic image processing options. Well shot images can be the input for automatic grading.



### Downward looking camera

- Image capturing
- Position recognitions (fiducials and wires)
- Failure modes analysis and grading



### Side view camera

- Secondary viewpoint
- Tool alignment



### Trinocular camera

- Live video images
- Tool alignment

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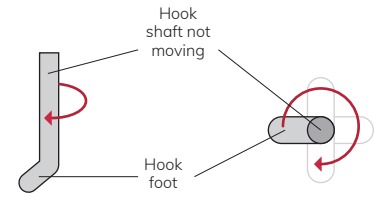
# Automation

## Tool alignment

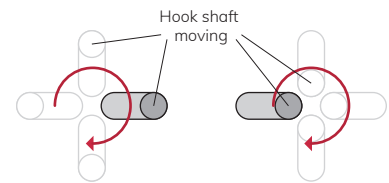


- **Self-aligning shear tool**  
A tool to correct the smallest angular differences between the tool and the sample, thereby avoiding point contacts.
- **Deep access**  
Tooling and flexible cameras to test complex sample architecture.
- **Revolving Measurement Unit**  
Switch between different tools in seconds with our 6-in-1 test head (RMU).
- **Concentricity correction**  
Achieve tool eccentricities less than 5  $\mu\text{m}$ .

### ☑ Concentric



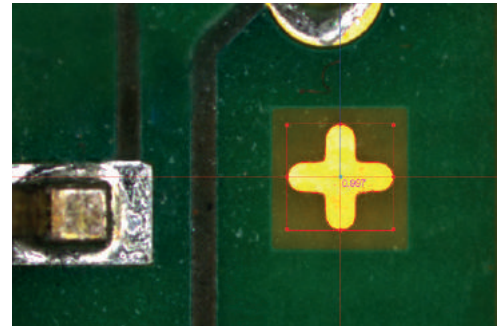
### ☒ Not concentric



## Fiducial recognition



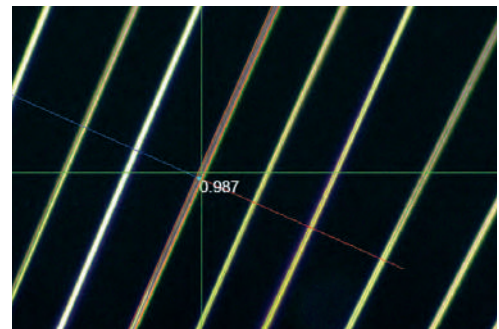
Define recognizable shapes, patterns, or marks as a global or local reference for positioning and automatic alignment.



## Wire detection



Recognition of components and fine pitch wires that are swept out of position due to process tolerances or part handling.



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## Auto grading

Many leading manufacturers automatically grade the failure modes of the test result images. For ball shear, smart optical inspection algorithms calculate the percentage of the remaining bond material in the region of interest and identify the failure mode using classifications. You can also automatically grade other types of bond failures.

Operators do not need to fulfill assessments by accepting or editing the failure modes at the end of an automation run. With deep learning and the advanced Halcon library, we train a neural network to do the image processing for you. By classifying the failure mode criteria beforehand, image recognition is ready to perform automatic grading without any assistance.



## Grading run

Traditionally, operators do the grading after each test. The Sigma offers two alternatives to make this process more efficient and consistent.

1. The operator does all the gradings in one step after a sequence of tests, using the microscope or an offset camera.
2. A Sigma can take it one step further and make automatic determinations of the failure modes (auto grading).



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## Image measurement

Detailed optical inspection helps you to perform image measurements or to identify the failure modes of the captured test results.

Quickly measure manually in captured images by drawing lines or shapes (rectangles, ellipses) and measure:

- Distances
- Lengths
- Widths
- Heights
- Areas

## Automated Optical Inspection (AOI)

For more advanced image processing, filtering, segmentation, and detection of shapes, you can use Automated Optical Inspection (AOI). AOI allows you to examine test results and to measure features between objects, and angles.



Measurement				Results				
Open	Pict.	Exp.	Str.	Seq.	Dis.	Angle [°]	Area [µm <sup>2</sup> ]	
				4815	4		-81.4	2528752.8
				4815	3		-78.1	2530446.5

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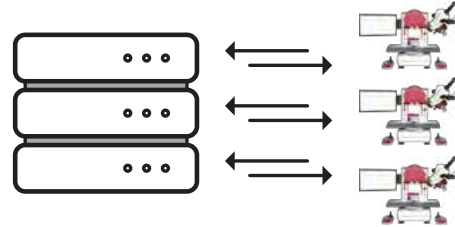
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## Data communication

Automatically store the reports after several measurements. The editor supports export to file, serial port, clipboard, and other protocols such as SECS/GEM.

### Share between systems

- SQL based system
- Share all setups and data among machines
- Centralized back up
- Storage capacity
- Historical information records
- Data integrity



## SECS/GEM

SECS/GEM is an equipment interface protocol for equipment-to-host data communications in the semiconductor industry. Several xyztec customers use the bi-directional SECS/GEM capability of the Sigma for test results, images, recipes, and other data.

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