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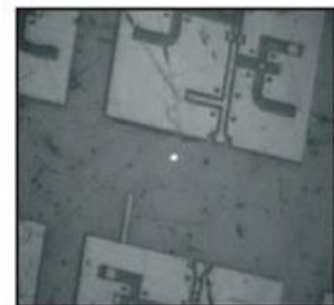
## LEM Camera



### Real Time Interferometric Process Monitor [CCD] Laser Interference Camera

The LEM camera can be mounted on any process chamber with direct top view of the wafer and provides a real-time digital CCD image of the sample surface making spot positioning simple. Based on the interferometry technique, the camera is ideally suited to etch/deposition rate monitoring and endpoint detection, providing high precision detection of film thickness and trench depth and also interfaces.

- Operating at 670, 808 or 905 nm, designed for OEMs and laboratory QC, the LEM camera provides a simple analog output of signal intensity that can be treated by integrator or HORIBA software:
  - If LEM as a sensor only, analog signal output is managed directly by integrators
  - If LEM as a Complete instrument with Windows PC, we provide HORIBA Software dedicated to interferometric monitoring and endpoint



*Camera image makes spot positioning simple*

- The CCD camera produces a real-time digital image of the wafer surface allowing the laser beam to be positioned accurately using an XY stage.
- The LEM includes illumination intensity control to optimize the visibility of the laser spot on different samples depending on their reflectivity. This significantly enhances image quality.
- Interference occurs when monochromatic light hits the sample surface, resulting in different optical path lengths due to film thickness and height variations in the film.

Segment: Semiconductor  
Division: Dry Process Control  
Manufacturing Company: HORIBA

## FEATURES

Three types of lasers are available and compatible with a broad range of films including SiN, SiO<sub>2</sub>, GaAs, InP, AlGaAs, GaN...

This system consists of a compact interference measurement section that includes the laser source, light receiver, and optical components, as well as the illumination and CCD imaging camera, allowing monitoring of any area of the wafer surface using microscopic images. This system uses visible (670 nm) or NIR laser (808, 905 nm) which can be used for a broad range of films.

### Sensor head: Camera with CCD imaging

A large objective lens to wafer distance attachment range of 200 mm to 800 mm. The use of lasers enables a spot diameter as small as 20 mm to 100 mm. A compact, self-contained amplifier design that allows simple monitoring of 0 V to 10 V outputs with only a camera if connected to devices such as a data logger.

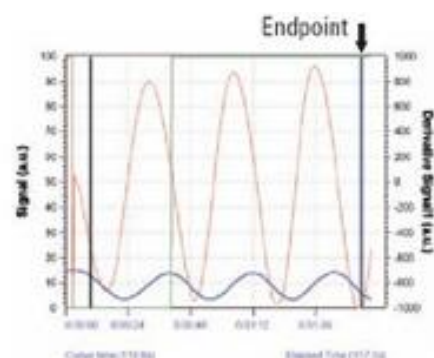
2 Options : Controller PC and XY stage

- LEM Controller PC



This system calculates the etching and coating speed of the monitored area by monitoring the interference intensity based on the cycle, leading to detection of the end-point from the prescribed film thickness and trench depth.

Based on this theory, this system is extremely stable and can be used with complex multi-layer films.



Real-time view for the etch of photoresist on Si, endpoint detected at 1204 nm

## Frame grabber

The frame grabber permits to optimize camera setup position and also to set the spot on the right location for process monitoring.

## Traditional interference wave type

The horizontal axe represents time. An interference cycle is generated with respect to the etching depth as the etching process progresses. The amount of etching during one cycle is displayed as  $\text{Thickness/Depth} = \lambda$  (laser wavelength) /  $2n$  (refractive index of etching film).

## Software ready for built-in use in processing lines

This is a system for achieving high yield rates with semiconductors. Statistical processing from batch database compilation, remote control I/O common with the Semiconductor Manufacturing Process Monitor, TCP/IP and RS can be included as optional features.

## End-point detection algorithms with improved flexibility

With HORIBA JOBIN YVON's own alarm expansion settings feature, a large number of compatible algorithms for special signal detection and detection of signals with poor S/N ratios are included and can always be expanded.

## Advanced reprocessing features

Data obtained once can be simulated a number of times to achieve the optimum parameter configuration. This data can also be sent directly to HORIBA for analysis and optimization.

- XY stage

### Manual XY stage 16 \* 16 mm

When access on stage is relatively easy, Manual stage is the simple way to set camera spot on samples

### Motorized XY stage 25 \* 25 mm with a joystick

Installing the XY stage with a joystick, you will be able to move the camera installed on the top window of the tool directly from the clean room without any software nor tool climbing ...



## SPECIFICATION

<b>LEM CAMERA</b>	
<b>Light source</b>	Laser diode
<b>Light source wavelength</b>	670 nm, 808 nm, 905 nm
<b>Magnification</b>	50x (G50) or 120x (G120)
<b>Spot diameter</b>	20 µm to 100 µm depending on camera to wafer distance
<b>Detector</b>	Pin-photo diode
<b>Camera Dimensions</b>	65 (W) × 160 (H) × 100 (D) mm 2.6 (W) × 6.3 (H) × 3.9 (D) in (camera only, excludes stage)
<b>Camera Mass</b>	1.2 kg, 2.6 lb
<b>LEM PC</b>	
<b>Controller Dimensions</b>	172.5 (W) x 225 (D) x 213 (H) mm (6.9" x 9" x 8.52")
<b>Controller Mass</b>	4.3 kg (9.5 lbs)
<b>Manual XY stage</b>	
<b>Manual XY stage Travel range</b>	±8.0mm
<b>Manual XY Stage dimensions</b>	120 (W) × 120 (H) × 87 (D) mm 4.7 (W) x 4.7 (H) x 3.4 (D) in
<b>Manual XY Stage Mass</b>	1.3 kg, 2.8 lb
<b>Motorized XY stage</b>	
<b>Motorized XY stage Travel range</b>	±12.5mm
<b>Motorized Stage dimensions</b>	167 (W) × 117 (H) × 112 (D) mm 6.6 (W) × 4.6 (H) × 4.4 (D) in
<b>Motorized Stage Mass</b>	2.6 kg, 5.6 lb

## Options

- XY stage                      Manual or motorized (with Controller and Joystick)
- PC Controller                WIN 7 professional 32 bits, industrial PC, Memory 2 Gb,  
CPU Core I3, HDD 500 GB, 24 V

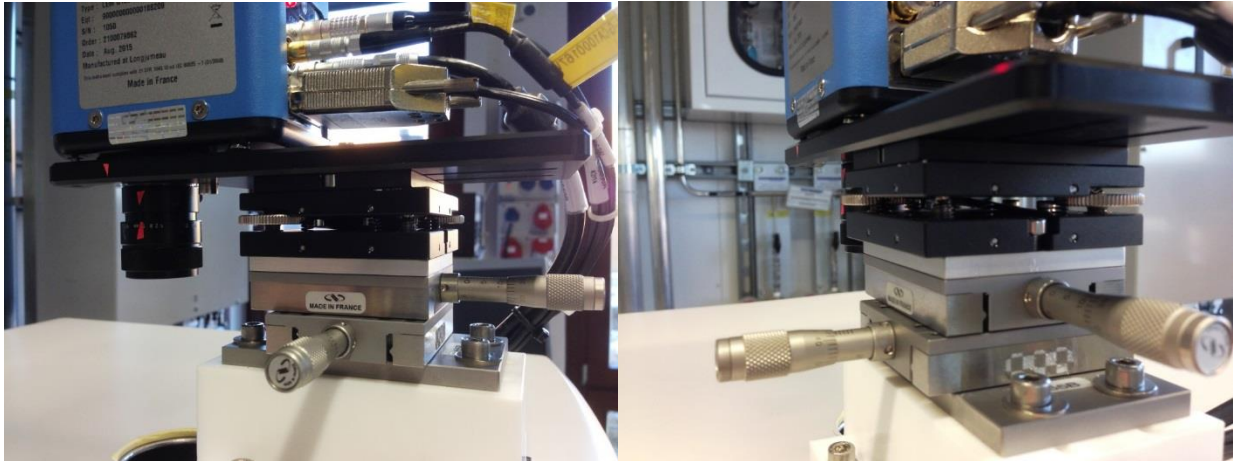
## Attachment conditions

A measurement view port of ø20 or greater will be required in a vertical direction across the wafer.

- **2019 UPGRADE KIT FOR EASY TILT ADJUSTMENT (OPTIONAL)**

If camera position avoid easy tilt management, especially when samples geometries needs each time new tilt adjustment, we propose you an upgrade kit for easy tilt setup (Not delivered by default)

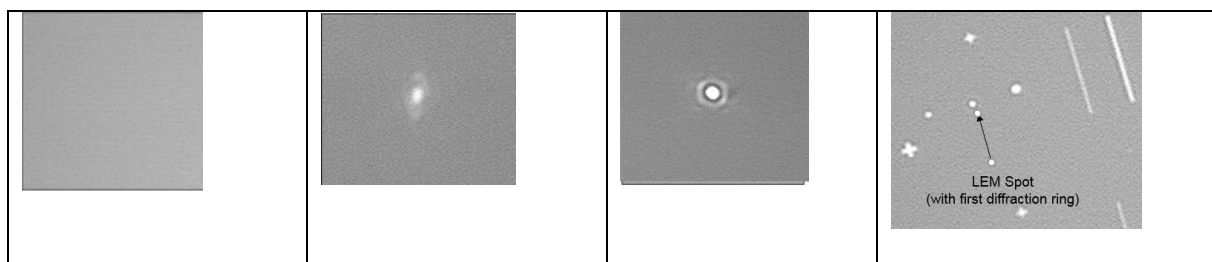
It consists in a mechanical add-on to install within 5 mn between XY stage (manual or motorized) and camera sock



THEN, you will be able to **adjust EASILY LEM camera tilt**, using 2 fingers at the same time:

<p>ROTATE THE LEFT WHEEL WITH THE LEFT HAND FINGER</p> 		 <p>ROTATE THE RIGHT WHEEL WITH THE RIGHT HAND FINGER</p>
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To obtain at least the perfect perpendicularity between LEM (circular spot with first diffracting ring), as shown below:



**For more information, please contact us!**