

SCALA Scanning Laser Analyzer

SCALA TECHNOLOGY

Mecwins[®] offers an optical platform for MEMS characterization using its **proprietary technology**.

SCALA is a complete tool to characterize your devices (cantilevers, bridges, membranes, etc.) in air, liquid, and vacuum environments. Importantly, measurements can be taken in both static and dynamic modes. Additionally, **SCALA** can deliver 3D images with topographic information of your MEMS.

The main goal of Mecwins[®] is to offer a robust and ultrasensitive technology to be applied to the evolving field of mechanical based sensor devices.





TECHNOLOGY PRINCIPLES

Mecwins[®] technology consists of sweeping an object's surface with a laser while the reflected beam is registered by a position sensitive detector (PSD). The laser is above two motors which move it along the surface in the XY plane. The PSD collects the position of the spot and intensity. The combination of the laser sweep with the signal received in the PSD allows for the reconstruction of the surface topography.



PC-BASED SIGNAL PROCESSING AND USER INTERFACE



SENSING PRINCIPLE

Cantilevers are the most typical MEMS currently being studied as sensors. They are generally operated in either the **static** (deflection mode) where binding on one side of a cantilever causes an unbalanced **surface stress** resulting in a measurable deflection up or down, or the **dynamic** (resonant mode) where binding on the cantilever increases mass and thus changes the **resonant frequency**, thus creating a measurable phase shift.

Cantilever-based devices have been demonstrated as highly versatile sensors to detect gases, chemicals or biological entities.

3D OPTICAL READOUT

In the Mecwins[®] platform, the displacement of the read-out laser beam provides a fast acquisition and the capability to follow the **full 3D profile** of MEMS of any size, shape and design and in real-time.





www.mecwins.com

EQUIPMENT

SCALA is a modular platform. The basic platform consists of an optical scanner with a climatic chamber (temperature and humidity control). Static characterization of 2D profiles, resonant frequency determination through thermal noise, and single-point measurements are all possible with the basic platform.

In addition to the basic platform, SCALA can be equipped with 3 modules:

- dynamics module
- liquids measurements module
- 3D imaging module

The aim of this modular design is to aid researchers in many diverse fields, such as materials science, biochemistry, medical diagnosis, MEMS developers, food science, etc. to adapt the technology to ongoing research, while having an instrument versatile enough to meet future needs as research evolves and changes .





DYNAMICS MODULE

The dynamic behavior of the mechanical sensors (**cantilevers**, **bridges**, etc.) can be measured in a simple and user-friendly manner.

This module is capable of detecting the spectral response of any vibrating device, both relying solely on thermal excitation or with an external force (driven by a piezo stack). **SCALA** also provides real-time imaging of the mechanical vibration



MODULE FOR LIQUIDS MEASUREMENTS

SCALA offers the possibility to characterize statically and dynamically MEMS sensors in a liquid environment.

The volume of the measurement chamber can be adapted to the customer's requirements. The PEEK liquid cell has inlet and outlet ports to deliver liquids using the external delivery system of your choice.







3D IMAGING

Taking advantage of the scanning laser capabilities, the technology is able to obtain reflectivity and topographic images with subnanometric accuracy in the z-axis.



www.mecwins.com

MARKETS & APPLICATIONS

SCALA offers the possibility to perform different kinds of experiments using one single platform: 3D images scan, dynamic and static measurements, and liquid measurements. **SCALA** is an instrument of interest in diversified fields, from MEMS characterization to clinical analysis.

BIOCHIPS

The sensitivity provided by **SCALA** for **biomolecule** detection using cantilever arrays is 100 times better than the sensitivity of label dependent microarrays.

MONITORING AND CHARACTERIZATION OF MEMS

Ability to produce 3D images in the real and frequency domains.

BIOMEDICINE

DNA/protein detection, bacteria classification, drug development.



-

MATERIALS

Surface roughness and topography.





FOOD SCIENCE

Food safety and quality control.



SOFTWARE

Mecwins[®] has developed a proprietary user-friendly software based on National Instruments LabVIEWTM.







TRACKER

Characterization made easy.

Location and characterization of surface features or MEMS devices such as cantilever or bridge sensors are easily achieved by our TRACKER, an algorithm based on recognition of reflected intensity patterns. This capability of **SCALA** allows the user to characterize a single sensor or an array of them in a fully-automated procedure. The algorithm is able to recognize both commercial and in-house developed mechanical sensors.





SPECIFICATIONS

Description: SCALA basic platform includes:

	 Integrated electronics and optical measurement unit. CPU with control software included.
	TFT monitor + keyboard + mouse + sample monitoring webcam.
Detection modes	STATIC
on basic platform:	1 Point measurements (adjustable position).
	Profile measurements.
	DYNAMIC
	Thermal Noise Measurements.
Scanning range:	XY scan field area: 12,5x12,5 mm ² .
	XY scan repeatability: ±50 nm.
	XY scanning speed: 0.0001 mm/s - 10 mm/s.
	XY motor's minimum step: 100 nm.
Optical system:	High quality circular CW laser beam:
	• Spot size = 4μm.
	• Wavelength = 635 nm.
	 Max. Power = 5 mW (laser power tuneable upon customer's petition).
	Low-Noise, High-Sensitive, duolateral-2D-PSD + Amplifier bundle:
	• Bandwidth, f_{3dB} = 400 KHz.
	 Available Sizes = 10x10mm² and 20x20mm² (Max. PSD rise time depending on PSD size).
Vibration isolation:	Passive vibration isolation platform.
'ertical detection range:	Topography gradients measurement range from 0.1 nm to 30 μm.
Lateral resolution:	Limited by laser spot size.
Relative Humidity	Range: 0100%.
control:	Accuracy: 0.1% (nitrogen flow required).
	Maximum flow rate: 5 L/min.
	3 operational modes: manual, automatic (control of a desired RH value) and profile (control of continuous increasing and decreasing
	ramps of RH with different velocities).
Temperature control:	Range: T _{ROOM} -5°CT _{ROOM} +20°C.(different temperature range upon request).
	Accuracy: 0.05°C.
	3 operational modes: manual, automatic (control of a desired T value) and profile (control of continuous increasing and decreasing
	ramps of 1 with different velocities).
3D Imaging module:	In plane resolution of 1 µm.
	Subnanometric vertical resolution.
D	Topography gradients measurement range from 0.1 nm to 30 µm.
Dynamic module:	 Plezo acoustic excitation for multiple sensor arrays with an external signal generator of 20 MHZ. Uide consistence of the external signal generator of 20 MHZ.
	 High-sensitive, low noise optional setup with PLL + Lock in amplifier (Lock-In Dahowidth, J_{adb} = 1 MHZ).
	 Excited requercy weasurements: An easily entry of the share of given mechanical sensors excited in ough a piezostack. Eisemede Chare Measurements: 2D and 2D measurements of the share of given media sensors excited through a piezostack.
Liquid Modulo:	 Eigenhoues shape Measurements. 2D and 3D measurements of the shape of eigenmoues excited through a piezostack.
Liquid Module.	Liquid Chamber.
	Volugio Pors. Timet, and Toutiet (inquid handling must be done with an external system of your choice).
	• Motorial - DEFK
Sample Mounting	One loading cartridge with a sample holder (customizable)
Software	Own multi-functional software based on National Instruments LabVIEW TM
Joitware.	

Electrical Requirements: AC Input Voltage: $110-230 V_{AC}$, 50-60 Hz.



Mecwins S.L.

Headquarters and sales office Santiago Grisolía 2, PTM, CP 28760 Tres Cantos (Madrid) Spain Tel: +34 91 804 9064

www.mecwins.com

General Information: <u>info@mecwins.com</u> Applications: <u>cesteves@mecwins.com</u> Engineering: <u>asalvador@mecwins.com</u> Sales Department: <u>rcalleja@mecwins.com</u> <u>dpowers@mecwins.com</u>

www.mecwins.com