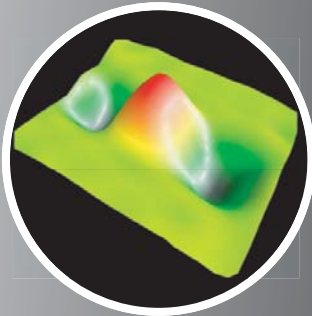


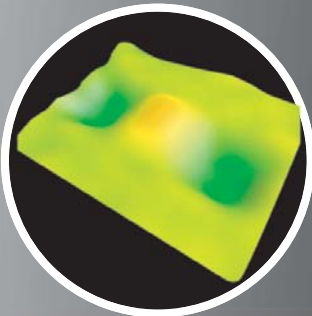
MEMS Solutions

Ultra performance solution for dynamic measurement in plane and out of plane

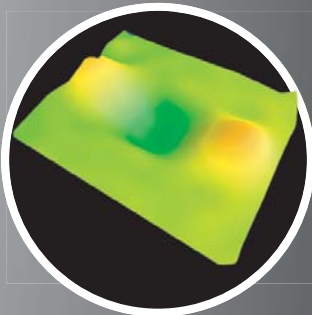
Option for Fogale profilers enabling stroboscopic measurement with nanometer accuracy



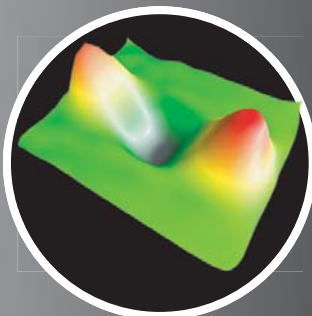
$$\varphi = \varphi_0$$



$$\varphi = \varphi_0 + 60^\circ$$



$$\varphi = \varphi_0 + 120^\circ$$



$$\varphi = \varphi_0 + 180^\circ$$

Images of a Chromium membrane taken from a real time vibration mode display

> Dynamic characterization of devices in functioning allows measuring precisely the vibration mode shapes and the deformations of the devices, from 100Hz to 2 MHz.

> A fully automated measurement technique allows measuring amplitude and vibration phase map, allowing the direct comparison with the finite-elements simulations.

> The excitation electronic modules are suitable for Electrostatic (voltage), PiezoElectric (voltage), or Thermal (current) actuation of MEMS, with a very large bandwidth.

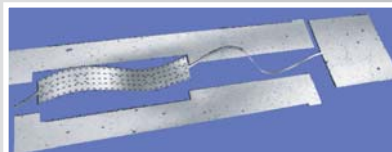
> MEMS Solution is an option for **Photomap** and **ZoomSurf** microscopes.

> MEMS Solution option doesn't need an external electronic box.

Vibrometric measurement capability :

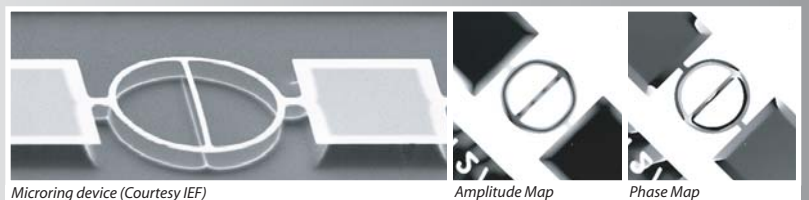
> **Direct observation of MEM'S motion**

> **Stroboscopic deformed shape measurement**



Courtesy of TRONICS Microsystems

> **Automatic stroboscopic mode shape measurement (Full field phase and amplitude)**



Microring device (Courtesy IEF)

Amplitude Map

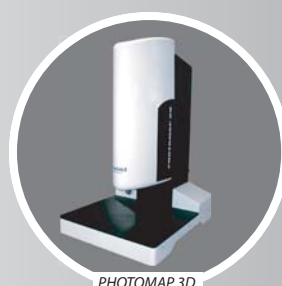
Phase Map

> **Real time mode shape measurement**

> **Vibration spectrum with no frequency limitation, amplitude vs frequency or amplitude vs time measurement**



ZOOMSURF 3D



PHOTOMAP 3D

MEMS Solution

Material and software description

SPECIFICATIONS

Light Source :

- Software controlled
- White light and monochromatic
- Automatic power adjustment
- Stroboscopic 2 to 20% light pulse duty cycle
- Up to 2MHz bandwidth
- Controlled light pulse phase, auto phase sweep function
- Internal or external synchronization input

Sample excitation signal :

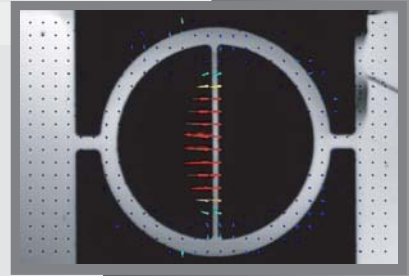
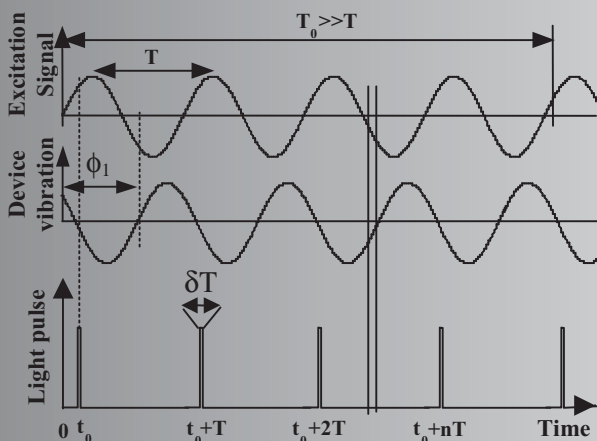
- Software controlled
- Frequency 100Hz to 2MHz, resolution 10^{-6}
- Amplitude 10mV to 10V
- Offset 10mV to 10V
- 1% Resolution
- Sinusoidal and square signal
- Power 1W, current output max 100mA.
- High voltage option :
 - . Amplitude up to 200V, offset up to 200V, 1% Resolution, Sinusoidal and square signal
 - . Power 20W, current output max 100mA

Software module integration in FOGALE Pilote software

- Full field camera view of device in motion
- Deflected shape measurement :
 - . Automated out-of-plane and in plane mode shape measurement (vibration amplitude and phase map)
 - . 3D animated reconstruction of device motion
- Vibration spectrum measurement (no frequency limitation except excitation signal)

Stroboscopic principle :

Light pulse is synchronized on device vibration, showing the device in a frozen position



In plane measurement

Rapidity

Fast, precise and easy to use, MEMS Solution provides accurate result in just a second.

Adaptable

Due to its portability, MEMS Solution can be easily mounted other systems for OEM industrial and laboratory applications.

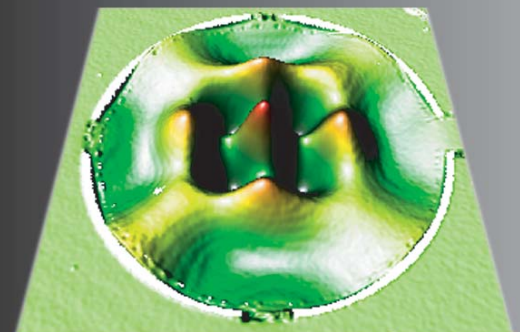
Powerful analysis software

Fogale 3D software is an intuitive, interactive and very powerful metrology software providing an extensive range of data analyses.

Cost-effective

MEMS Solution provides all the benefits of Fogale's technology in an economical package.

This module can be combined with MEMS vacuum box option, allowing MEMS characterization under vacuum or thermal load.



3D visualization of a piezo electric membrane deflection vibrating a high order mode

Courtesy EPFL

Fogale Nanotech

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