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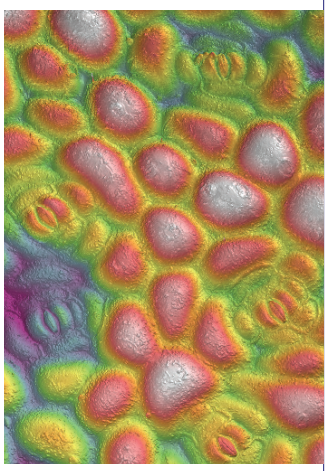
KLA-Tencor

MicroXAM-800

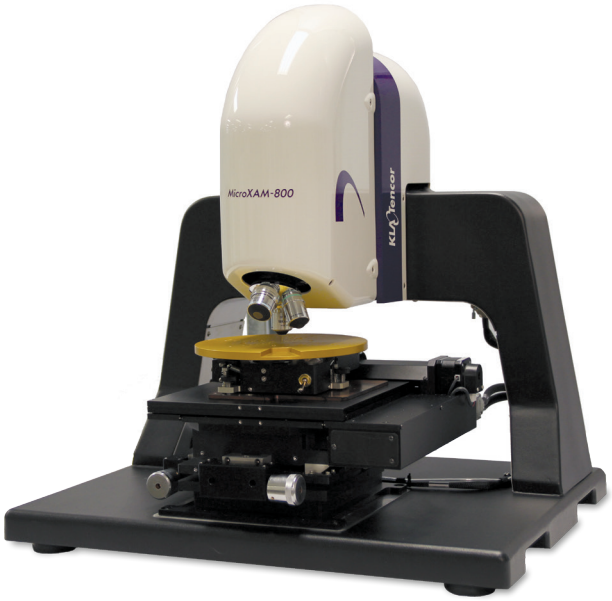


OPTICAL PROFILER

Production Series – White Light Interferometer for
3D Measurement of Surface Topography

MicroXAM-800

OPTICAL PROFILER



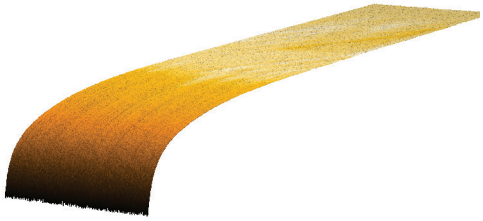
Overview

The MicroXAM-800 is an optical surface profiler from KLA-Tencor's surface metrology product line. This non-contact, white light interferometry system differentiates itself with an innovative yet simple user interface. It features a powerful suite of functions to support the broadest range of applications.

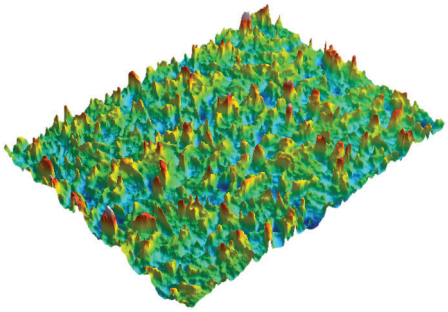
The MicroXAM-800 is a flexible platform for both acquiring and analyzing data. The system includes the hardware and software features necessary to meet stringent R&D and production environment requirements. Features include programmable stages, simple recipe set-up, scripting, and an expandable library of analysis tools. A variety of objectives, sample stages, and options are available to meet the needs of any application.

Applications

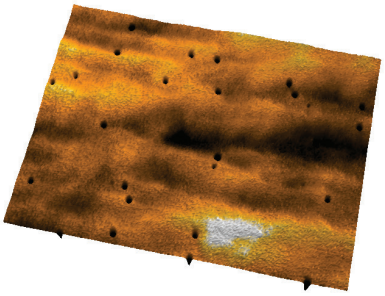
The MicroXAM-800 supports applications in R&D and production, measuring texture, step height, and form. It is used in a variety of industries: LED, power devices, medical devices, MEMS, semiconductor, solar, and precision surfaces.



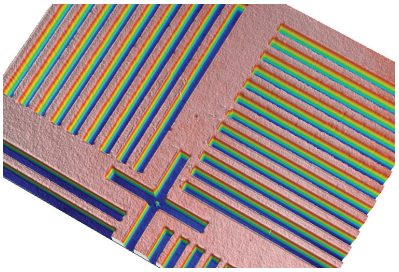
Roll Off: Sapphire edge profile; 5x1 FoV stitched with a 5x objective



Topography: 1.4 µm RMS roughness with a 20x objective



Defect Review: 1 µm GaN micro-pits (dark spots) with a 50x objective



Step Height: Alignment target etch depth with a 20x objective

MicroXAM-800

OPTICAL PROFILER

Powerful New Software Platform

The MicroXAM-800 features a new software platform with an innovative, yet simple interface. The software has been designed with ease of use in mind.

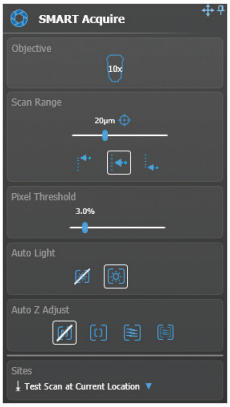
SMART acquire is a simplified acquisition mode that makes intelligent control setting decisions based-on a single user input – the vertical scan range. The remaining scanning control adjustments follow automatically. This enables users to rapidly obtain good results with minimal training, improving time to results, and simplifying the user experience.

ZSI acquire is a powerful acquisition mode that allows multiple surfaces separated by large z distances to be scanned individually and combined into one image. The high resolution linear encoder preserves height measurement accuracy for surfaces that are separated by more than 250 µm. ZSI can also be used to scan the same area at multiple light levels to handle situations where the topography has widely different reflectivities. ZSI introduces a search algorithm which quickly locates surfaces within a user-specified range and determines the appropriate parameters to measure each surface.

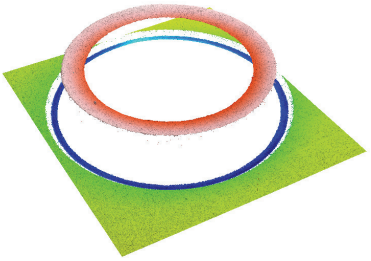
Stitching enables scanning an area larger than a single field of view by combining contiguous sample areas into a high-resolution image. At right is an example of combining ZSI acquire with stitching to measure a large surface volume. A 20x objective was used to capture the higher sloped regions, which would not be possible with a lower magnification objective.

Scripting simplifies the creation of sophisticated measurement and analysis workflows. Scripts are created by dragging and dropping functions onto the script toolbar. They can be saved, recalled, modified, and assigned as a single button 'favorite' for subsequent quick application to other data sets. Individual scripts can also be integrated into a higher level 'Automation Script' to enable fully automated production measurements at multiple measurement sites.

The cross-section tool creates a 2D view from a section through a 3D scan. 2D analysis is automated with the 3D Single Profile function. It automatically extracts single or multiple 2D profiles, which can be followed by automatic cursor placement with on feature detection and 2D parameter calculations.

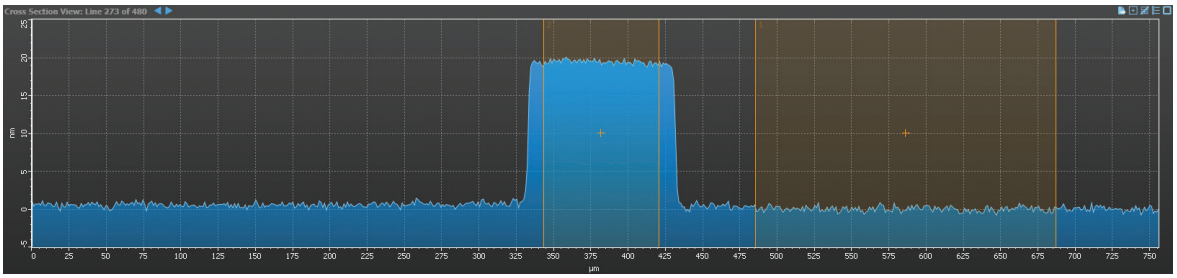


SMART acquire simplifies the user experience



ZSI and Stitching with 20x Objective
3 by 3 mm in X-Y and 500 µm in Z

Script with acquire, level, step height, and push to Apex



Cross-section tool for 2D analysis

MicroXAM-800

OPTICAL PROFILER

Theory of Operation

3D optical profiling uses white light interferometry (WLI), to generate high-resolution height maps. This is also known as coherence scanning interferometry (CSI).

The principle of operation is based on splitting a beam of incoherent light into two beams, redirecting one to reflect from a reference mirror, and the other to reflect from the sample surface. After reflecting, the beams travel to the CCD camera, where each pixel acts as an independent light detector. The light recombines coherently when the path distances for the two beams are matched. The resulting interference pattern at each camera pixel contains high resolution height information about the corresponding surface point. By sweeping the objective's vertical position by a known distance, different pixels in the camera view will go in and out of coherence at a known height. In this way a 3D surface image is constructed across all pixels.

Hardware Features

The 1.4 megapixel camera provides high resolution imaging at 1360 by 1040 pixel resolution. By switching the camera to 'binning mode' adjacent pixels are combined, doubling the imaging speed at 680 x 520 pixel resolution.

A 250 µm piezo actuator is included for high resolution scanning over a large Z range.

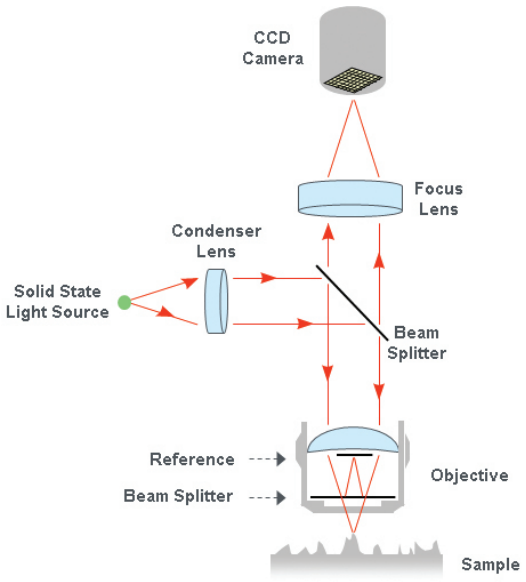
The five position turret holds objectives with magnifications ranging from 5x to 100x to support both micro- and macro-topography applications. The turret can be quickly removed to directly mount either a 2.5x or 5x objective. Calibrations keep your feature centered and focused when switching between objectives.

A solid state light source with green and white LEDs support SMART, PSI, VSI, and ZSI acquisition modes. LEDs provide a stable, long-life source of light, reducing the cost of ownership.

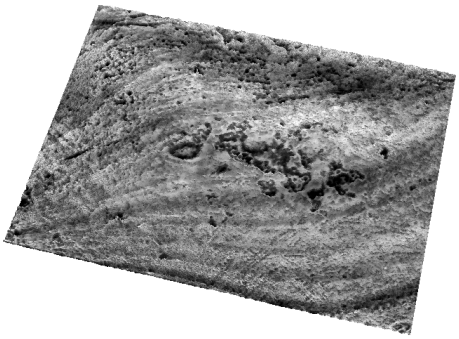
Motorized stages for the X-Y and Z-axis are standard on the MicroXAM-800. The X-Y stage has a range of 152 mm by 152 mm. The Z stage has a range of 125 mm, and supports an optional 76 mm offset block for taller samples. An optional theta stage has a range of 360°. The travel along all axis of motion is programmable with scripting.

Several sample holders are available to support a variety of sample types. Options include a simple flat surface, an optical bench layout, precision universal chucks (150 mm or 200 mm), and the solar chuck (156 mm x 156 mm). The chucks include locator pins for various sample configurations and a manual vacuum switch.

A Windows 7, 64-bit computer with a 23-inch widescreen monitor is standard. MS Office is included, enabling direct copy-and-paste transfer of data from the MicroXAM-800 software to PowerPoint, Word, and Excel.



MicroXAM-800 theory of operation diagram



Metal Texture: 95 nm RMS roughness with a 20x objective

KLA-TENCOR SERVICE and SUPPORT

Customer service is an integral part of KLA-Tencor's portfolio that enables our customers to accelerate yield. Our extensive customer service organization collaborates with customers worldwide through the life stages of their factory and tools to achieve the required productivity and performance at the lowest overall cost.

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