

NanoTest SiP Wafer

Fast Optical and Electrical Characterization Station
for SiP Wafers



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Testing and qualifying the integrated circuits on a wafer before dicing is an important step in the production chain of photonics chips. Nanotest SiP fulfills these requirements ideally. It is designed for the operation over long periods with minimal maintenance. Its modular architecture makes adaption to new production tasks easy.

Superior Design for Reliable Operation

The powerful and versatile Nanotest SiP test station accommodates wafers up to 12 in. diameter. It delivers precise results which help to qualify and sort the individual chips and sections according to their performance. The solid granite structure with a vibration damping system makes the station insensitive against external disturbances. All mechanical and electrical components of the system meet highest quality standards.



The wafer chuck presents various vacuum zones which can be activated as necessary. Combined with the excellent flatness over the chuck surface, the wafers are securely held without any distortion.

Temperature-Controlled Chuck

The precision ground chuck carries wafers up to 12 in. diameter. Wafers with smaller diameter can be tested as well – the vacuum which holds the wafers firmly in place has 4 zones which can be activated as required. The temperature of the chuck is settable over a large range from -20°C up to 100°C. Purging with nitrogen avoids icing at low temperatures.

Optical Probes

NanoTest works with one or two optical probes depending on the test program for a given wafer. The probes are either single mode fibers or fiber arrays. For grating coupling, the optical probes have an incidence angle between 0° and 20°.

All optical probes use 6 independent motorized alignment axes. The search routines are fast and all parameters are easily altered. This allows for perfect adaption of the specific alignment task. For very high demands regarding alignment time, OptoSpin is added. This device provides extremely fast searches and reduces the alignment time for single fibers and fiber arrays down to a few seconds.

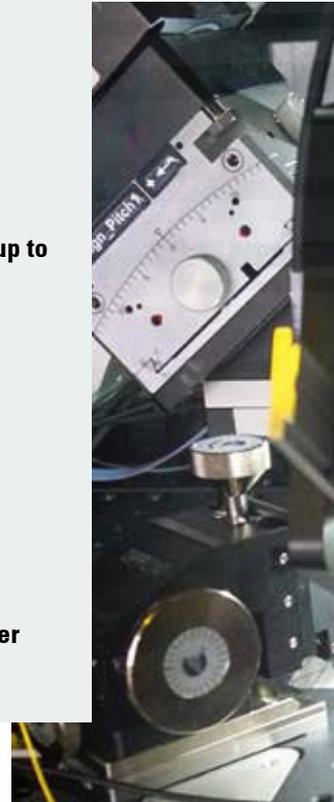
When working with single chips and edge coupling, the optical probes are modified accordingly. Edge coupling of a diced wafer is possible within certain limitations.

Electrical Probes

All types of electrical probes can be accommodated by NanoTest. The platform for mounting the probes provides an ample amount of space. It consists of magnetic steel with a passivated surface making it compatible with magnetic holders. In addition, M6 mounting holes with a 25 mm pattern offer additional fixing points (respectively ¼" 20 threads in a 1" pattern). The XYZ alignment stages for the probes have a travel range of 12.5 mm and a precision of 1 µm. Besides individual RF and DC probes, also probe cards can be used.

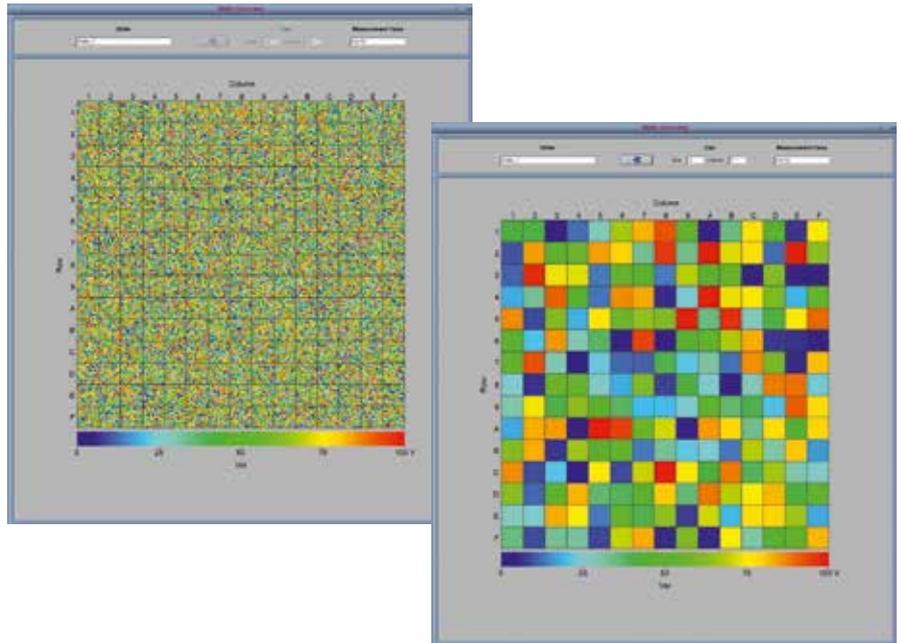
Benefits of NanoTest

- Rapid testing of wafers
- Versatile configuration
- Accommodates single chips up to 12" wafers
- Integration of various test instruments
- Precision motion control
- Calibrated measurement
- Height mapping capability
- Color-coded graphic of wafer performance



Fast and Accurate Wafer Shuttle

The axis configuration for shuttling the chuck utilizes linear motors with linear encoders. The movement is smooth and without any vibration. Two precision classes are available. The standard performance of the motion axis offers a resolution of 20 nm and a precision of 100 nm. For extremely demanding applications, 5 nm resolution with 25 nm precision can be achieved. The rotary table which carries the chuck rotates $\pm 90^\circ$ with a resolution of 0.001° .



Powerful Machine Vision

NanoTest uses advanced machine vision capabilities. A CCD camera with a powerful lens assembly detects smallest details on the wafer like fiducials or product numbers. The zoom function offers the inspection of larger areas on the wafer. If automatic inspection and documentation of the wafer are not required, NanoTest can be equipped with a conventional microscope for manual inspection.

All measurement results will be displayed with a color code and show the wafer performance at a glance. Each cell can be called individually for further investigation.

An additional CCD camera measures the distance between the tip of the optical probes and the wafer to avoid that the probe hits the surface unintendedly.

LED lighting illuminates the inspected area. The switchable wavelengths cover the range from blue to near IR and the light is emitted either continuously or in flash mode.

Wafer Profiling and Height Mapping

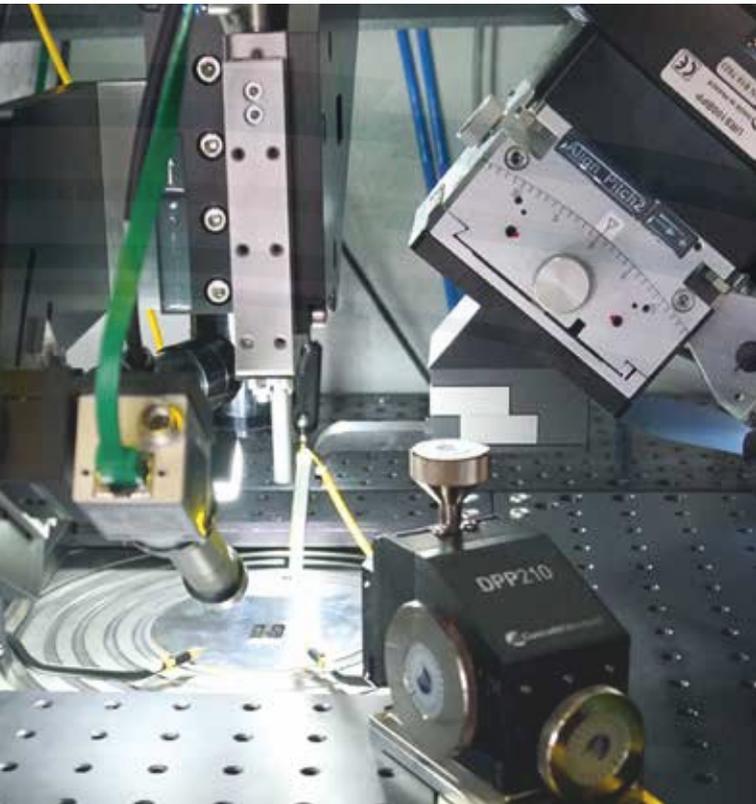
An optical distance sensor measures thickness variations and tilt of the wafer. The values are stored and a map of the wafer can be created. The values are also used to correct the distance between the probe tips and the wafer.

Modular Software Package

The software package TestMaster controls all functions of the system. This includes the entire motion control, the acquisition of measurement values as well as the documentation of the pictures obtained by the CCD cameras. TestMaster has interfaces for instruments like OSA, precision current and voltage source, optical power meters, frequency generators and network analyzers, RIN measurement and more. It interfaces with other programs such as Python or MATLAB.

All measurement data can be stored in a local database or can be transferred into the customer's data handling system.

Measurement results over the wafer surface or sections of the wafer are displayed in color code. This shows the overall quality of the wafer at a glance.



For Silicon Photonics wafers, up to two alignment stacks with 6 degrees of freedom align the optical probes with submicron repeatability. The mounting platform holds the electrical probes which stay in a fixed position after initial manual adjustment.

Options for NanoTest

Upper Enclosure

In the standard version, the NanoTest is equipped without the upper enclosure. In case the ambient conditions influence the result, the optional enclosure will offer the needed protection. The enclosure has feedthroughs for the RF cables. A HEPA filter mounted on top of the enclosure provides clean room condition in the testing area.

Automatic Wafer Loading

The addition of an automated loader allows for fully automatic and unattended operation over long time periods. The wafers are automatically loaded onto the chuck and processed wafers are delivered back. The loader has 10 positions for wafers. Various wafer sizes are handled up to a maximal diameter of 12".

Ultrafast Alignment with OptoSpin

The optional OptoSpin provides extremely fast alignment and reduces the alignment time for single fibers and fiber arrays down to a few seconds. The motion elements are optimized for rapid acceleration. The closed loop design eliminates position errors and the resolution is 1nm and the motion range is 50 µm x 50 µm.



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