nanosystec
PRECISION AUTOMATION

NanoTest

Fast Optical and Electrical Characterization Station

NanoTest

Reliable Test for Optoelectronic Wafers and Chips

All NanoTest stations combines precise measurements with high speed, proven reliability and ease of use. The versatility qualifies the stations not only for high volume quality assurance, but also for demanding development applications.
This qualification helps to differentiate well-working devices from the ones with mediocre performance. In this way, unnecessary processing of low-quality devices is avoided early and possible problems during wafer production will be determined.

NanoTest-W characterizes the optical and electrical behavior of VCSEL or Silicon Photonics chips on wafer level, while NanoTest-C is used for laser diodes, receivers and passive devices on bar or chip level.

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

A precision ground chuck with high flatness holds wafers of up to 6" or 12" diameter. Independent vacuum zones allow for testing wafers with different diameter and even single chips.
The temperature of the chuck can be varied between 15° C and 100° C. For bar testing, a knife-edge design is used.

Fast and Accurate Motion Control

Linear motor stages with large travel range move the wafer into the respective measurement position. Their large dynamic range ensures high accuracy and throughput at the same time. Linear optical encoders allow 5 nm resolution. A rotation axis aligns the coordinates of the wafer to the stepping direction of the linear axes.

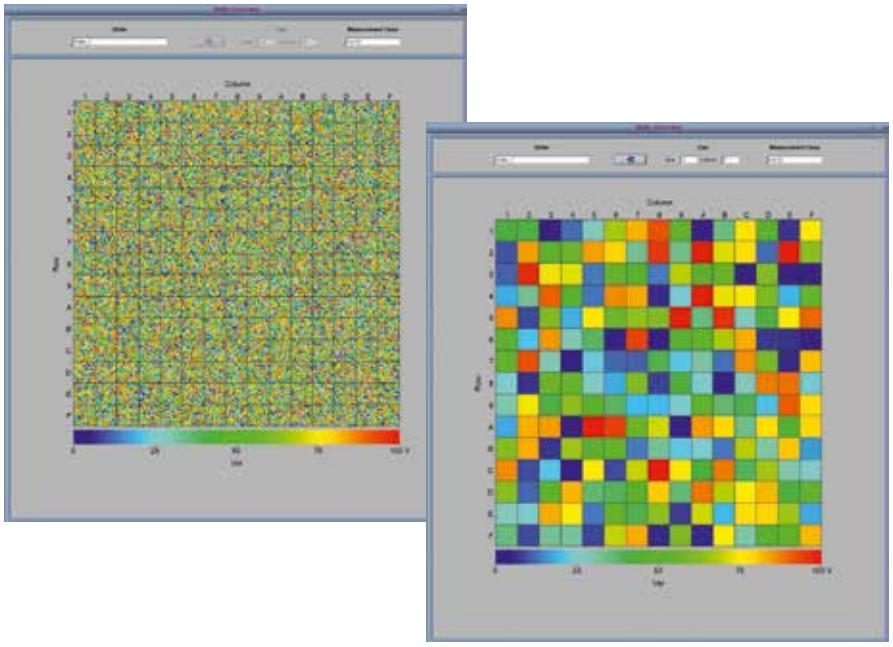
Versatile Optical Measurement

Silicon Photonics and Passive Devices: Up to six degrees of freedom allow for precise alignment of the optical probes which consist of a single mode fiber or a fiber array. The accuracy is better than 0.1 µm for linear axes and 0.001° for rotary motion. Depending on the device structure, one or two alignment stacks can be integrated. The feedback signal for maximum coupling efficiency will be picked up from an external detector or from an integrated receiver.

VCSEL and Active Devices: An integrating sphere in a fixed position collects the light emitted by the laser. For more demanding applications, a multimode or singlemode fiber is actively aligned for maximum transmission and guides the collected light to the optical measurement instrumentation, such as photodetectors, optical spectrum and network analyzers. For laser diodes, nearfield and farfield distribution can be characterized as well.

Benefits of NanoTest

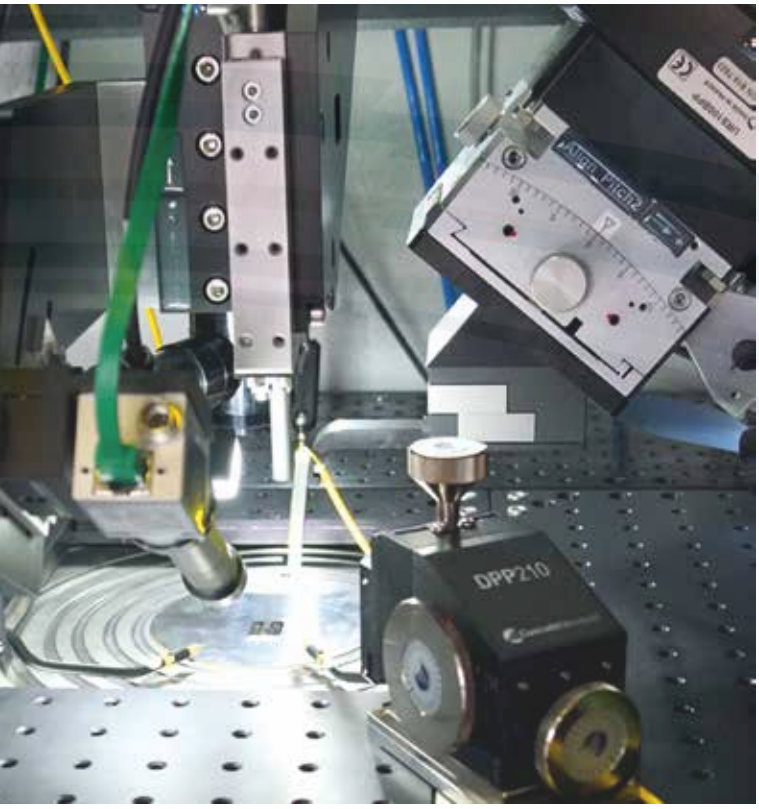
- **Rapid testing of wafers**
- **Versatile configuration**
- **Accomodates single chips up to 12" wafers**
- **Integration of various test instruments**
- **Precision motion control**
- **Calibrated measurement**
- **Height mapping capability**
- **Color-coded graphic of wafer performance**



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.

Electrical Probing Platform

A ferromagnetic platform with M6 mounting holes in a 25 mm pattern is arranged around the optical measurement position. The precision probe manipulators with the electrical probes can be fixed with a magnet or with screws. In the standard configuration, the electrical probes are adjusted once and stay in a fixed position, while the wafer is shuttled into position and electrically contacted.



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.

Machine Vision and Sensors

A CCD camera with zoom lens inspects the devices under test and recognizes the serial numbers automatically. Various lighting schemes are applied for best device illumination. Fiducials on the device can be used for precise positioning.

Additional cameras provide side view of the devices and probes. A collision sensor is used to maintain a fixed distance between the optical probes and the device and thus avoids collision.

Distance sensors provide height mapping capability for the wafer.

Modular Software Package

The process software TestMaster controls all system functions and interfaces with other programs such as Python or MATLAB. Various instruments can be integrated into the process flow. Standard instrumentation includes current sources, light sources, optical spectrum analyzers, network analyzers and many more.

The graphic interface displays panels for system functions, such LIV curves, OSA measurement and S factors of the network measurements.

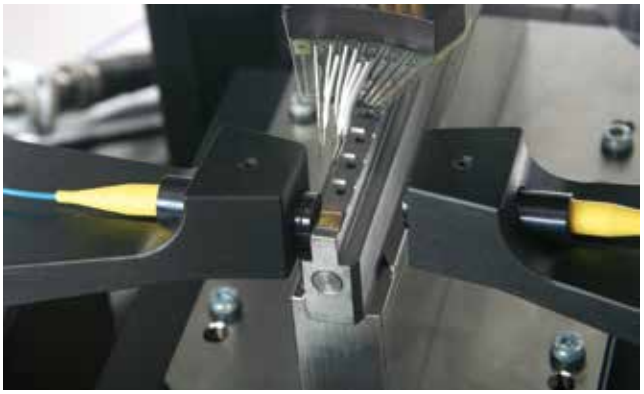
In addition, the measurement results over the wafer surface are displayed in a color code. This shows the overall wafer quality at a glance. Each cell can be called individually for further investigation.

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

Bar and Chip Test

The versatile design of NanoTest is the foundation for modifying the station for testing other opto-electronic devices on bar or chip level. These include laser diodes, receivers and modulators. Depending on the desired volume and temperature requirements, the mechanical design will be adapted accordingly.

The modular architecture of the TestMaster software allows for easy integration of additional instrumentation.



The opto-electronic test of a Mach-Zehnder modulator requires an optical alignment in the submicron range while the chip is temperature-stabilized.

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