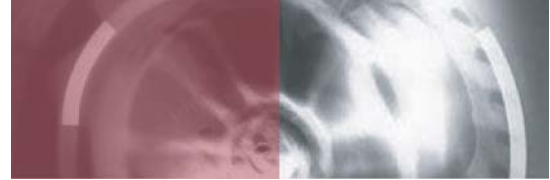




**White Paper**

**Case Study**



## **Integrated Metrology Systems**

June 2006

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## Challenge

Nanometrics engineers were faced with the challenge of introducing their own robot stage for their metrology tools. With years of expertise working with third party robotic stages, Nanometrics engineers had insight on the current problems within the industry. Their past experience with robotic stages, forced them to use a separate control panel and mechanical stage. This made their metrology tool more complex and increased the footprint of their tools. With the cost of semiconductor manufacturing space at a premium, this large footprint was a growing problem with their customers

Nanometrics' goal was simple; produce the most compact, reliable and advanced metrology tool on the market.

## Solution

At the time, Nanometrics engineers were not specialists in motion control or amplifier technologies and to design a compact and accurate robotic stage would be a big challenge. After intensive searching, Nanometrics realized that Agile Systems was the only company on the market that had the expertise and the product line to support their vision. Agile and Nanometrics engineering were able to eliminate the external control panel and produce a sub-micron accuracy tool.

## Benefits

One of the big factors in going with Agile Systems and a very important driver of the program was the ability to have the controller inside of the robotic stage. This greatly reduces the number of external cables and makes the integration of the system into process tools much cleaner. In most cases the host PC was 15-20 feet from the robotic stage. In the past, this meant running 15 cables 18 ft. With Agile's architecture, the only external cables are a network cable for control and AC power cable to power the stage. Nanometrics met their goal of having a complete control system integrated into the robotic stage with enough power, precision control and bandwidth to make the moves they needed with the stability that was required.



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Nanometrics' newly released next generation-integrated metrology systems were developed in partnership with Agile Systems for the capability of providing a multi-axis, high performance integrated motion control solution.

## Product

Agile Systems' 4-axis MAX 3000™ with FireWire interface, digital amplifiers and high resolution sin/cos encoder feedback requires a footprint of only 3"x 5" x2" replacing an external box the size of a large PC chassis containing separate amplifiers and controller.

As seen in the photo, the MAX 3000™ controller is in the back/bottom portion of the stage. The only external cables to the system are the power cable and the FireWire communications cable. Agile Systems implemented a custom daughter card for extra I/O and sin/cos high-resolution encoders for the direct drive stage. Video is also carried over the Firewire in this implementation.

The system uses high force direct-drive motors under control of Agile's MAX 3000™. Nanometrics is able to achieve continuous 360-degree rotations of the 300mm wafer in 400 ms and a 7-inch move in 400ms hitting a top speed of 21 inches/sec during the move with sub-micron accuracy.



Nanometrics states: "Agile Systems makes the only controller today that has sufficient power, control precision and bandwidth to make these moves possible - not to mention that this all comes in a ~ 3 X 5 inch package. When we talk about reliability, Agile Systems makes a solid-state digital power device that has held up well in our reliability tests doing millions of stage cycles. "

## About Nanometrics

Nanometrics is a leading developer of metrology systems that precisely measure a wide range of film types deposited on substrates during manufacturing, in order to control manufacturing processes and increase production yields. The company serves the global semiconductor industry and is a leading metrology supplier to the flat panel display (FPD) and magnetic recording head industries.

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Semiconductor equipment manufacturers take Nanometrics' metrology systems and integrate them into the final Semiconductor Process Tool. The metrology stage allows them to monitor their process with sub-micron precision in real-time.

The collaboration of Nanometrics and Agile Systems resulted in the smallest and most precise integrated metrology system in the industry.

[www.Nanometrics.com](http://www.Nanometrics.com)

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