Specifications

Main Applications	On-line, in-air or in-water thickness measurement of dielectric and conducting transparent layers on multi layer stacks
Thickness range	Approx. 200 to 50,000 Å (application dependent)
Thickness accuracy (1)	1%
Precision (1σ) (2)	0.25%
Repeatability (1σ) (3)	0.5%
Stability (1σ) (4)	0.5%
Thickness measurement method	Spectrophotometry and spectrum fitting with dedicated algorithms for in-water measurement
Wafer size	150mm and 200mm
Number of measurement points	User-definable
Autofocus capability	In-movement dynamic method
Pattern recognition capability	Pre-alignment and site-by-site alignment
Wafer orientation	Random
Minimum pad size	35 µm
Overall test time per wafer (5)	10 seconds for 5 sites
Communication between NovaScan systems	Ethernet
Communication with host or polisher	SECS II compatible through RS 232 or HSMS
Closed loop control capability	Polish time feed-forward and feedback control and process alarms
Integration concept	On the polisher, wafer measured in water or in air
Dry measurement unit size/weight	320L x 274W x 192H [mm] - 13/29 [kg/lbs]
Wet measurement unit size/weight	334Lx 276W x 246H [mm] - 20/44 [kg/lbs]
Control Unit size/weight	392Lx 380W x 188H [mm] - 10.5/23 [kg/lbs]

(1) In reference to NIST certified thin film thickness standard

(2) Statistical measured error of 30 measurements at the same point

(3) Based on multiple point-to-point and wafer-to-wafer measurements

(4) Based on long term measurements at the same point

(5) Typical, excluding wafer handling to the measurement position

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NOVA®
partnering for process control

NovaScan® 2040

Advanced Integrated CMP Metrology

MAXIMIZE 200mm FAB YIELD

- Higher Cpk & Yield
- ROI of less than 6 months
- Migrate to next technology node
- Reduce number of polishers & consumables

NOVA®
partnering for process control

In a climate of competitive pricing and financial uncertainty, you need a way to maximize revenues on your 200mm fab with minimal investment

Introducing NovaScan 2040, Nova's advanced Integrated Metrology (IM) platform for 200mm CMP polishers. Fully integrated into the polisher, NovaScan 2040 applies spectrophotometry technology to measure the thickness of dielectric and conducting transparent films directly on the polisher before and after the polishing of the wafer takes place, and uses this data to perform immediate adjustment of the CMP process for the next wafer. This allows the tightest possible wafer-to-wafer (W2W) control at cycle times that are more than 10 times shorter than Stand Alone (SA) metrology – leading to over 50% increase in Cpk and a significant improvement in yield.

W2W – the secret to a higher Cpk and higher yield

Closed Loop Control (CLC) using IM is the key to substantially improving the CMP process and achieving higher Cpk and yield. While SA metrology allows only lot-to-lot measurement, the NovaScan 2040 IM platform allows W2W measurement and control. This drastically reduces the process variations prior and during CMP leading to high Cpk.

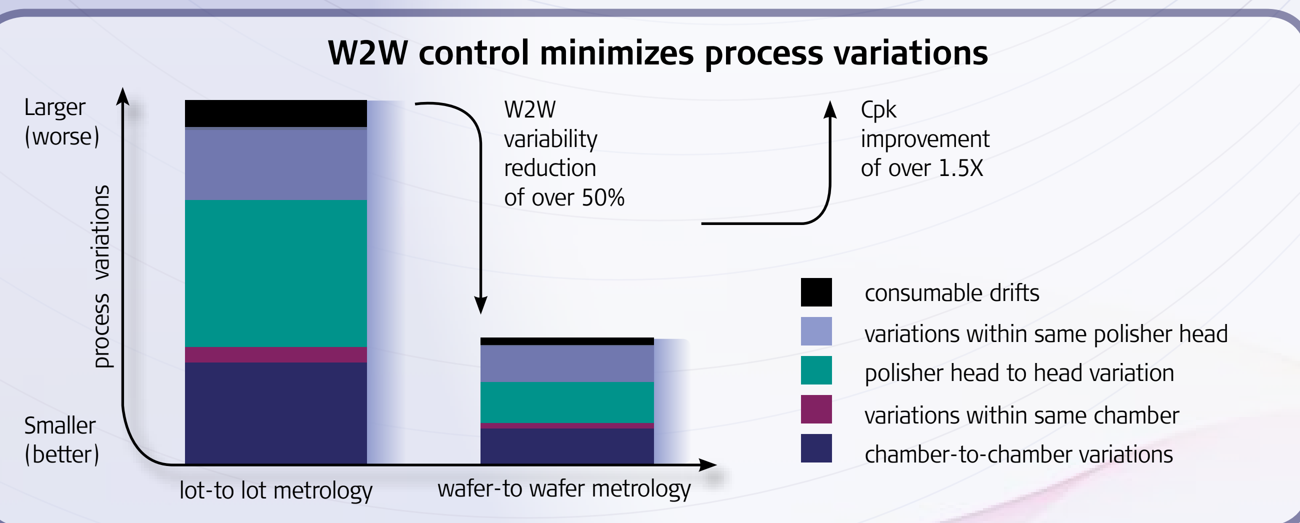
Reduced head-to-head variation - measuring the wafer before and after the actual polishing allows automatic adjustment of the polish time for each head according to its specific performance.

Incoming variation compensation - each wafer in each lot arrives with different characteristics. Incoming measurements allow automatic adjustments in polishing time for each such variation.

Consumables drift compensation - the erosion of the polishing pads during their short life span constantly alters their performance. Continuous measurements allow for automatic compensation adjustments in polishing time.

Reduced product-to-product variation - each product has different typical removal rate behavior. Nova's advanced process control allows automatic product to product transitioning without the need for gating wafers.

Migrating to next technology node - CMP is challenged with the need to reduce process window on polishers that were not designed to meet the new specifications. NovaScan 2040 W2W control is a production proven and cost effective tool to reduce process variations and to shrink the process window on existing toolset while maintaining high yield.



How NovaScan 2040 integrates into the production line

NovaScan 2040 offers Nova's patented option for seamless integration into the polisher. Both wet and dry integrations are available. Each wafer is measured before and after the polishing. The system's self adjusting control algorithms correct the CMP process by using feed-forward (of the pre-polish data) and feed-back (of the post-polish data) to produce the most suited polishing cycle for each wafer. Auto-Rework can be initiated automatically without human intervention if post-polishing measurements are not adequate, and audio-visual process alarms can be defined in order to ensure safe unattended automation.

An ROI of less than 6 months

NovaScan 2040's unique capabilities reduce overall CMP CoO to get an ROI of less than 6 months through increase of revenues and lowering of costs:

Higher Yield – CLC increases the percentage of components suitable for high-end devices on each wafer and reduces scrap wafers in each lot, leading to higher revenues.

Reducing number of polishers in production - CLC leads to increased polisher utilization and significant cycle time reduction which allows customer to reduce the number of polishers in production.

Consumables Reduction – W2W process control compensates for removal rate variations which provides 10% - 15% longer pad life for each polisher.

Lower Labor Costs – CLC means there is no need to manually route wafers to SA metrology, no need to set polish time manually and less time is spent on wafer work.

Our customers are saying

"We have seen a dramatic improvement in our Process Control...closed loop control has now been fully implemented onto all oxide polishers at Intel Ireland and Intel New Mexico"

Source: 6th AEC/APC Conference, "Closed Loop Control on Oxide Polish", April 2005

"Nova's integrated metrology provides advantages for total process time...we've seen a 33% decrease in cycle time"

Source: 6th AEC/APC Conference, "Integrated Metrology for Poly CMP Process Control.", April 2005

"Integrated metrology has reduced our rework rate by more than 5 times and improved our post CMP thickness variation by over 60%"

Source: "APC from A Foundry Perspective", September 2003