Fully Automatic Wafer Grinder
MULTI-NANO/3-300

Grinding Machines

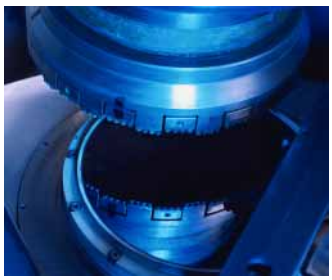
Genauigkeits Maschinenbau Nürnberg GmbH

General

The new G&N **MULTI-NANO/3-300** is a highly efficient and fully automated machine with Cassette to Cassette operation for grinding wafers up to 300 mm diameter. It shares many design features with the proven **NANOGRINDER**. It is also equipped with two grinding spindles and an air-bearing rotary table which contains three rotating chuck stations. But while the **MULTI-NANO/3-300** weight and dimensions are unchanged the cost effectiveness has been considerably increased.

Spindles

- G&N Machines are always equipped with application designed grinding spindles:

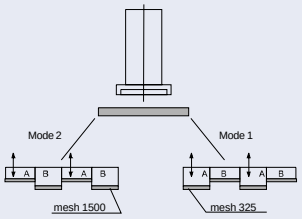


➜ lifetime (maintenance free) grease lubricated spindles (4000 rpm);
➜ air bearing spindles for high-speed grinding (up to 6000 rpm);
➜ magnetic bearing spindles (8000 rpm);
➜ TWIN-SPINDLE®.

Versions for increased flexibility and tighter tolerances.

- By utilizing the TWIN-SPINDLE® technology, rough and finish

Principle of TWIN - SPINDLE



grinding, as well as loading and unloading are handled simultaneously, which guarantees high throughput.

- Each spindle is mounted on an independent vertical slide assembly. The high-resolution measuring system allows downfeed steps to a minimum of 0.1 µm. All feed parameters:

➜ roughing;
➜ finishing;
➜ sparkout;
➜ return and direction,

are freely programmable.

- Moreover, with this machine, extreme low final thicknesses can be reached.

- The machine is designed using state-of-the-art modular systems, enabling the **MULTI-NANO/3-300** to be integrated into a fully automatic wafer fab.

Rotary Table

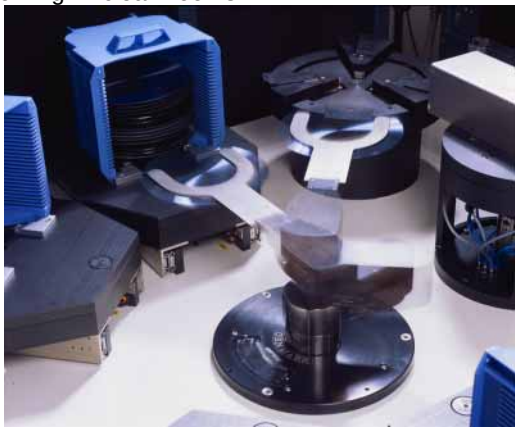
- The air bearing CNC rotary table transports the wafer between roughing, finishing and loading / unloading stations. The three rotary chucks are built into the table. Each vacuum chuck (all ceramic chucks) is mounted on a high precision spindle.

In-Process Thickness Gauging

- In-process thickness gauging is utilized to measure wafer thickness during grinding by using contact probes.
- Since the control always knows the actual wafer thickness and wheel position, it can stop the infeed, when the required wafer thickness is reached. In this way, the optimum in thickness accuracy can be achieved.
- Thus thermal influences and tool wear have no significant effects.
- This also allows, at the beginning of the grinding operation, the wheel to move very closely to the wafer surface with rapid speed, because the wafer preground thickness is measured.

Wafer Handling System

- The basic configuration for wafer handling has four cassette stations (2 loading / 2 unloading) and two high speed robots with a centering station and a wafer cleaning station.
- The handling is designed for working in clean rooms.
- The modular open ended handling design enables the integration of additional transporting, cleaning and measuring steps in the process cycle and the flexibility to adapt to prevailing space conditions.

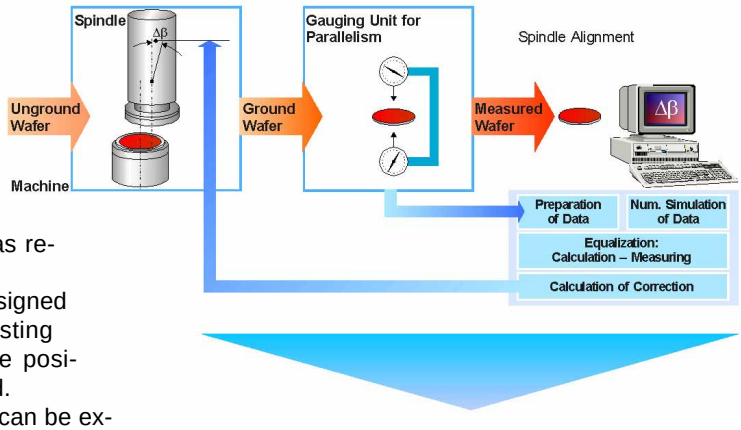


G&N Spindle Alignment

Strategy Produces Best Possible TTV's

The G&N Spindle Alignment Strategy is based on the fact that the geometry of a ground wafer can be quantified relative to the alignment of the grinding spindle axes.

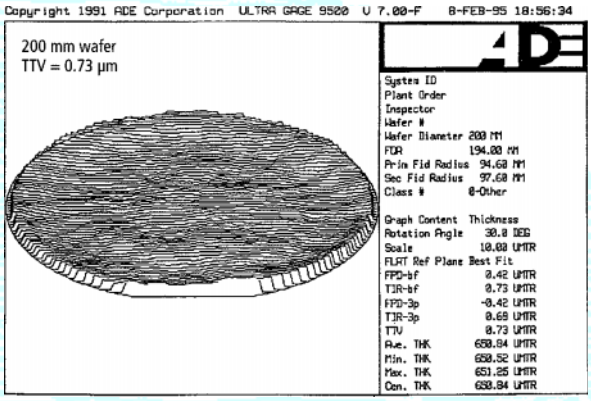
- After the grinding process, the thickness variation of the wafer can be measured with a special measuring unit.
- Then through a simulation process, the measured data is compared to the previous spindle alignment settings and correction values are calculated, as required.
- With the specially designed spindle alignment adjusting mechanism, the spindle positions are then corrected.
- Optimum TTV values can be expected when grinding the next wafer.



Machine Control

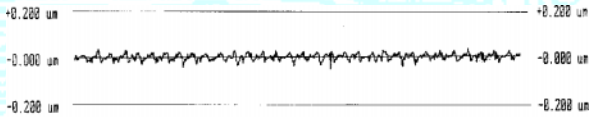
The machine is controlled by a SIEMENS® PLC. The user interface is a high performance, fully graphical Windows NT® program, which is specially user friendly developed (menu guided). The graphic display is a 14 inch TFT touch screen with 800 x 600 dot resolution.

Thickness Accuracy



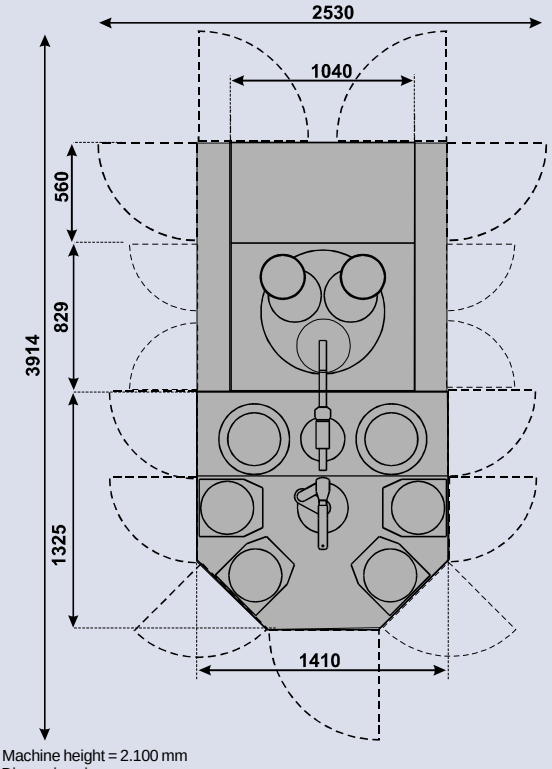
Surface Quality (finish ground with Mesh 2000 wheel)

R_a = 0.011µm $R_{max.}$ = 0.099 µm



Measured by Talysurf, Rank Taylor Hobson

Specifications



Machine height = 2.100 mm
Dimensions in mm

Wafer Diameter	**up to 300 mm**
Grinding Spindles	
2 ball bearing spindles	4000 rpm
2 air bearing spindles	6000 rpm
2 magnetic bearing spindles	8000 rpm
TWIN-SPINDLE® + optional spindle	7000 rpm (TWIN)
Output	**5.5 kW**
Grinding Wheels	**Diameter 250 mm diamond wheel**
Infeed System	
Vertical Speed Range	0.001 ... 50 mm/min
Min. Vertical Displacement	0.1 µm
Min. Vertical Resolution	0.1 µm
In-Process Gauging	
Range	0 ... 1200 µm
Resolution	0.08 µm
Accuracy	0.1 µm
CNC-Rotary Table	
Number of Chucks	3 standard / multichuck optional
Chuck Type	Porous ceramic (all ceramic type)
Rotary Speeds	5 ... 1200 rpm
Chuck Cleaning	**Water + wiper cleaning**
Wafer Cleaning	**workpiece rotating, water/air nozzle**
Throughput (300 mm Diameter)	**variable according to grinding process**
Accuracy	
Parallelism TTV	≤2 µm
Thickness Variation	≤2 µm
Surface Finish	R_{max} ≤ 0.01 µm (dep. on process and grinding wheel)

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