Wafer Grinder MPS T500

Grinding Machines

Genauigkeits Maschinenbau Nürnberg GmbH

G&N

Characteristics

Precision plunge grinding machine with cassette-to-cassette operation, post-process wafer measuring system, and 3 axes CNC control.

Application areas

Back grinding semiconductor wafers.

The MPS T500 can be easily integrated into the wafer fabrication process. The best in wafer tolerances and minimum damage depth is achieved with the maximum in stock removal and production rates. Nonproductive idle time during the grinding processes is eliminated through unique design. Loading and unloading takes place during the grinding process. The patented principle of plunge cut grinding guarantees the maximum possible protection against damage or breakage of the wafer.

Accessories:

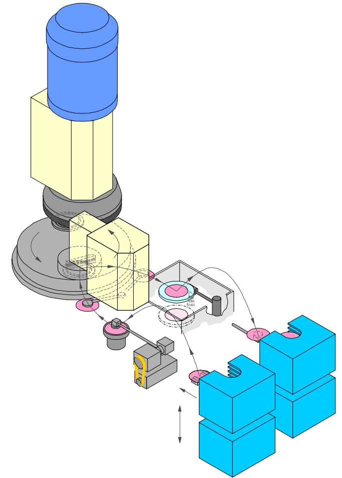
Automatic dressing device with rotating dressing wheel ø 180 x 20 x ø 30 mm bore. Drive of dressing wheel by electric motor and toothed belt.

Plunge Grinding in Semiconductor Production

One spindle – One Operation. The G&N-Patent for Maximum Precision.

High stock removal rates with minimum damage to the crystalline structure of highly sensitive and valuable materials; robust construction for maximum precision of the finished product: mandatory requirements of a fully automated heavy-duty grinding machine.

G&N has made it possible with its patented plunge grinding method.



This method provides simultaneous grinding of the full back face of the wafer. The maximum wheel contact zone is utilized to achieve high stock removal rates.

A single spindle supported in precision bearings is required for this grinding operation. The abrasive face of the diamond grinding wheel is wider than the wafer diameter. With the spindle feed in the axial direction, the back of the wafer is ground in one operation.

A strikingly simple concept and yet one which offers great flexibility in grinding parameters – applied to the MPS T 500, the G&N plunge grinding method offers superior performance.

The double-elevator mechanism with a storage capacity of 75 wafers in three cassettes ensures a continuous-flow operating cycle in the MPS T 500.

The Electronic Measuring *System*
Differential Measurement Compensates for Thermal Changes and Grinding Wheel Wear

A round-belt conveyor provides individual unloading of the wafers.

A vacuum pick-up arm in the first reversing station deposits the wafer, back face up, in a centering device.

The handling system transfer arm picks up the accurately centered wafer and places it on one of the two vacuum clamping stations on the rotary table. At the same time, the number two clamping station on the opposite side of the table is in its working position under the grinding wheel.

The cleaned and dried wafer is handled by the second reversing station and is deposited onto a round-belt conveyor and is returned to an empty cassette.

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The Grinding Cycle

Minimum Damage Depth and Maximum Stock Removal.

After a 180° rotation of the table, the wafer is located in the grinding position under the grinding wheel. Now the G&N plunge-grinding cycle, described earlier, begins.

Shortly before the programmed wafer thickness is reached, the downfeed stops. While the table rotates slowly, the wafer is finish ground by an additional outer grinding ring which projects down slightly beyond the face of the main grinding wheel.

This operation provides the finishing grind to produce the desired thickness. Surface finish and damage depth can be improved significantly, if the outer ring utilized is of a finer diamond grit size.

The grinding process can be optimally matched to the wafer material and the specified surface quality.

Every wafer is checked upon leaving the grinding wheel for final thickness.

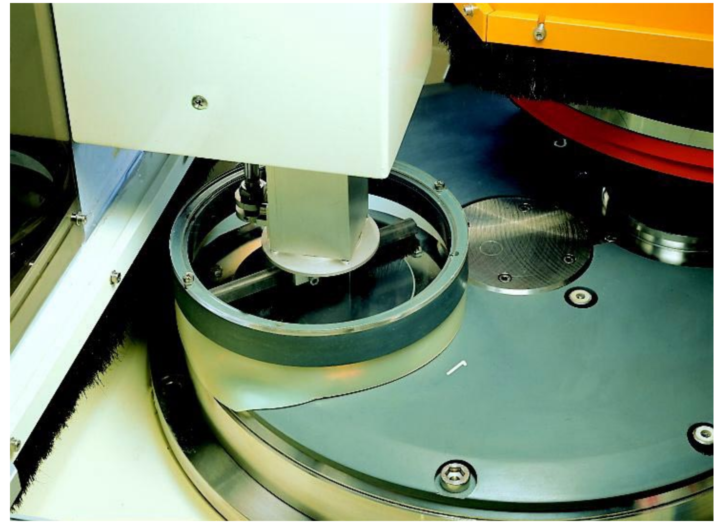
The rotary table dwells briefly for the measuring cycle.

Two inductive sensors are lowered pneumatically, one onto the finished back of the wafer, the other onto a reference surface on the rotary table. The thickness of the wafer is measured as the difference.

The surface of the vacuum chucking station is cleaned after every grinding cycle.

Grinding residue is washed away with water pressure through the porous ceramic chucking surface from below.

The High-Pressure Cleaning Station
Ultraclean Wafers – a Basic Requirement for Subsequent Processing Operations



Cleaning of the Workholding Surface
Maximum Cleanliness
Prevents Breakage and Microcracks

In addition, a rotary brush is utilized to thoroughly clean the chucking surface.

As a result, the next wafer is placed on a clean and dry ceramic surface.

Water is sprayed at high pressure through a fine nozzle onto the finished surface of the rotating wafer.

Subsequently, the wafer is spun at a very high speed to throw off any residual water. In addition, an air stream assists rapid drying.

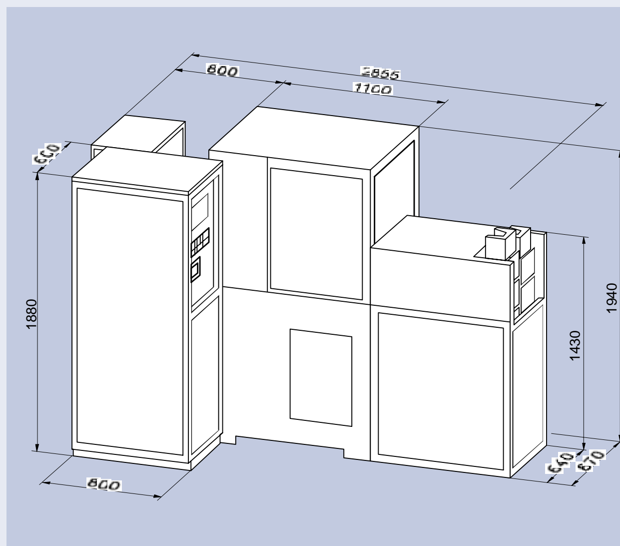
The Electronic Control System

A Logical Concept with Feedback and Fault Display – Provides Additional Assurance of the Highest Quality Level and Facilitates Easy Operation.

The precision and automated operating cycle of the complex MPS T500 would not be possible without a sophisticated electronic control system: a 3 axes CNC system for controlling the movements of the grinding spindle and the rotary indexing table as well as a freely programmable PC control for all other machine functions. Consistent feedback after each event and the display of any faults or interruptions in the cycle, substantially reduce the element of human error. Consequently, optimum production performance and consistency of quality level is ensured, even in a multiple shift working environment.

Specfications

Dimensions in mm



TYPICAL VALUES ASSUMING 100 MM DIAMETER WAFER	
Grinding capacity	60 wafers/h
Parallelism	< 3 µm
Thickness spread	<± 3 µm
Surface finish CLA	0.06 – 0.6 µm
Damage depth	4 – 11 µm
Stock removal rate	500 – 1000 µm/min
MACHINE	
Wafer diameter	50.8 (2 inches) – 150 mm
Storage capacity	75 wafers (3 cassettes)
Grinding wheel	400 mm (16") max. diameter
(cup)	164 mm (6.5") max. rim width
Grinding spindle	electric grinding spindle TSEV 160 s x 400, A.C. motor 220/380 V, 4 kW (5.5 HP) 1450 rpm and life-time grease lubrication (maintenance-free)
Fine feed	feed rate 0.1 – 50 mm/min (.004-2 in)
Rotary table:	diameter 490 mm (19.5") 2 vacuum-operated clamping stations, table speed: 0.05 – 30 rpm
ELECTRICAL CONTROL	
Fine feed and rotary table axis	3-axis CNC
Control of wafer handling and auxiliary functions	PC adaptive control (freely programmable)
CONNECTION DATA	
Total connected load	8kW
Power supply (alternative data on request)	220/380 V, 50 Hz
water supply	½ inch connections for inlet and discharge
Compressed air	4 – 6 bar (60 – 90 psi)

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