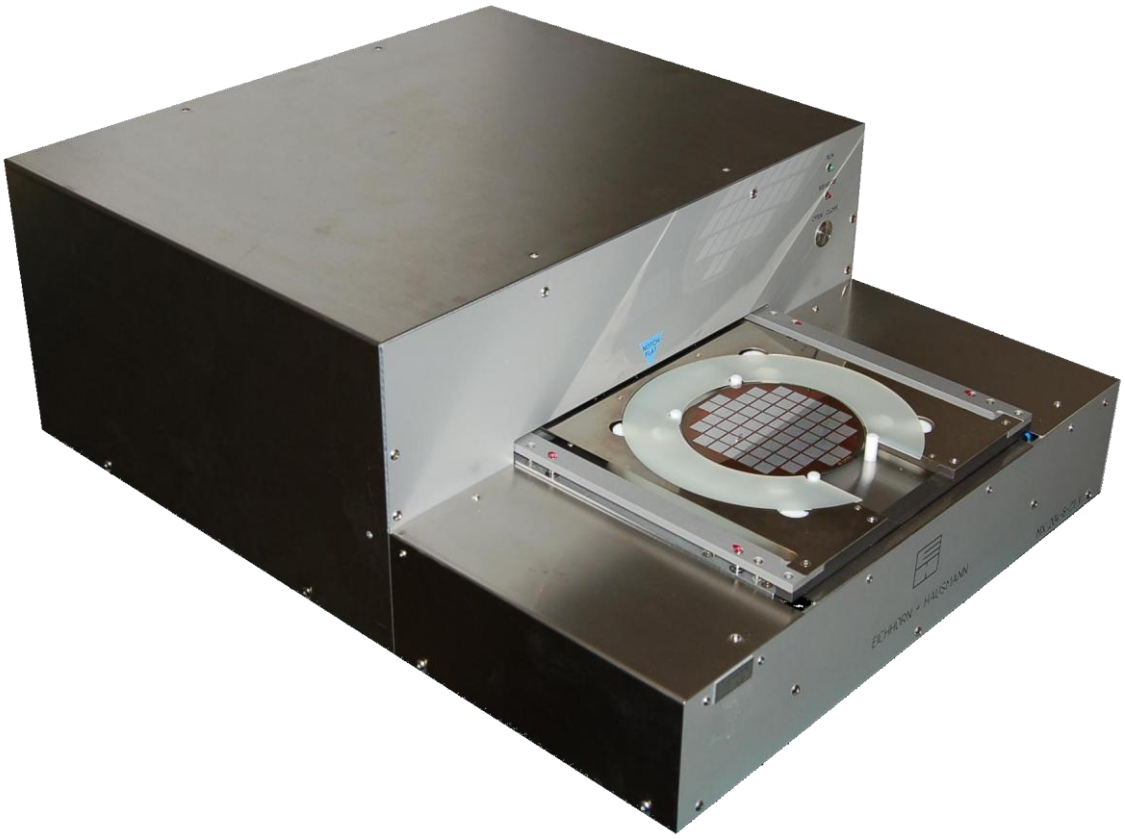
E+H
Metrology GmbH



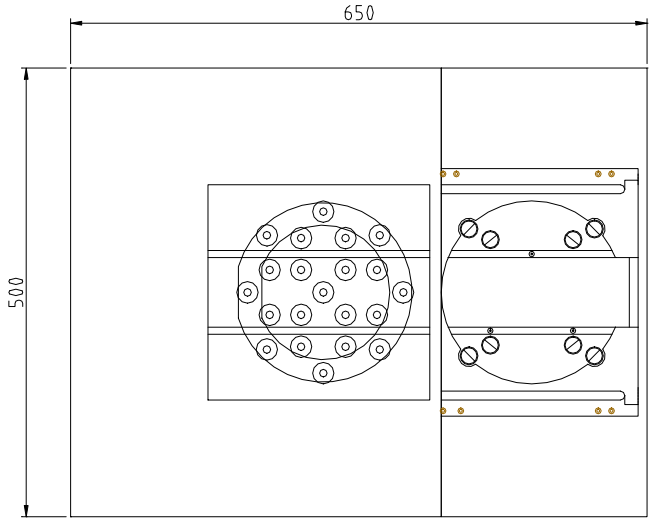
# MX204-8-21-V

Manually Loaded Wafer Geometry Gauge for thin 150 mm and 200 mm Silicon Wafers

## Application

Control of Thickness and Shape of Wafers After Backside Grinding

# 1 Description





The MX 204-8-21-V combines the following components to a compact stand-alone solution:

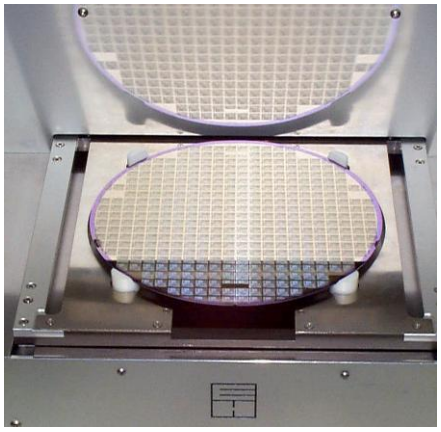
- one E+H wafer geometry station MX 204-8-21 with vacuum chuck and motor-driven tray
- a wafer centering station in front of the geometry station
- a PC (not included)

The MX 204-8-21-V is a manually loaded, semi-automatic wafer geometry measuring instrument for thin 150 mm and 200 mm silicon wafers. This equipment is dedicated to control the thickness and shape of backside ground wafers with or without protective tape.

Like on all other E+H wafer geometry instruments, E+H's technology of contactless capacitive distance sensors is applied.

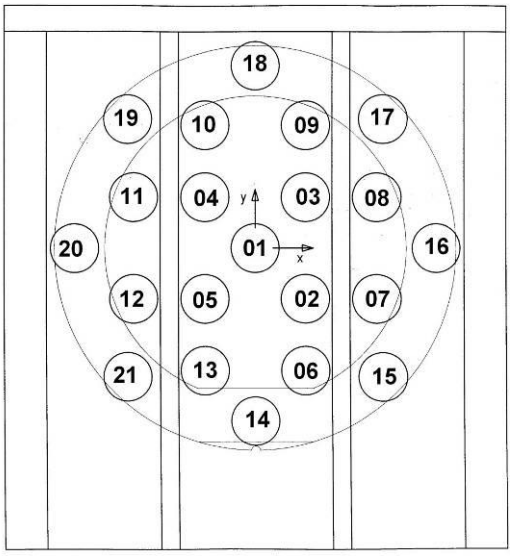
The throughput of the equipment is 80 wafers / hour or better.

## The Wafer Centering Station



In front of the wafer geometry station there is a wafer centering station, on which the operator lays down the wafer he wants to measure. Four posts with beveled ends center and support the wafer. When the operator has pressed the button on the front panel of the instrument to start the measurement, these posts retract and lay down the wafer on the vacuum chuck bars of the drawer. Provided the chuck has clamped the wafer, an electric motor pulls the tray into the geometry station and lowers it there in order to lay down the wafer on the lower probe plate.

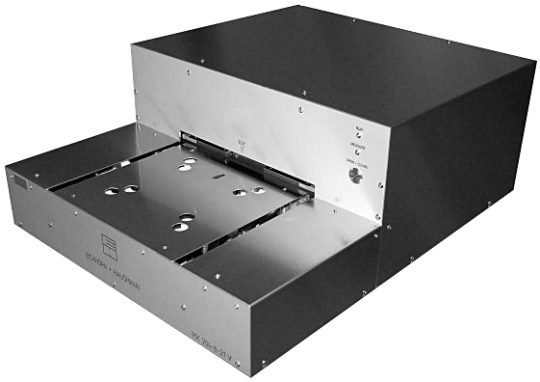
## The Wafer Geometry Station




The wafer geometry station consists of a lower and an upper probe head. Every probe head is based on a one inch thick flat plate into which 21 capacitive distance sensors are embedded in a radial pattern. Both sensor plates are mounted horizontally and face-to-face to each other. An eccenter system driven by a compressed air piston allows to raise and lower the upper probe head. In the raised position, there is room enough even for wafers having a very large warp. In the lowered position, the upper probe head is carried by three hard metal bolts with spherical ends mounted into the lower probe plate. This ensures a repeatability of this positioning of 0.1 µm.

The lower plate is covered by a plastic sheet containing air channels and suction ports providing the vacuum chuck. The vacuum chuck system has three separate circuits which can be activated sequentially. The dielectric of the plastic sheet would normally affect the capacitive measurements. Its influence, however, is eliminated as one result of the calibration of the system.

## Measurement Principle



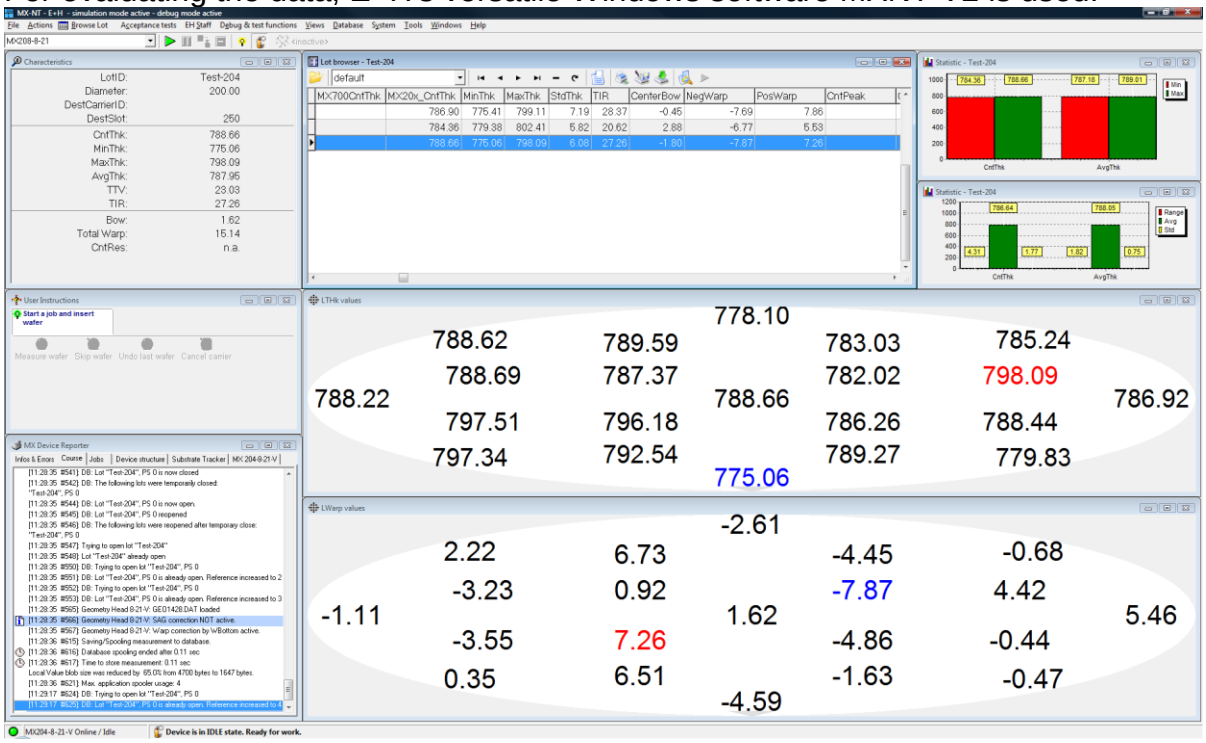
The thickness and warp measurements are performed in two consecutive stages.

In the first stage, the warp measurement, the upper probe head is in the raised position, the air gap between the probe heads is wide, and the wafer is resting freely on the surface of the lower probe head. Only the distance sensors of the lower probe head are used for measuring. The wafer shape measured under these conditions meets the Japanese definition of Sori. Another quite intuitive set of wafer characteristics is provided by the local distances between the lower probe plate and the lower wafer surface, respectively the local maximum among these.

For the second stage, the thickness measurement, the wafer is chucked to the surface of the lower probe head, and the upper probe head is lowered so the air gap is narrow. This enhances the precision of thickness measurements. The capacitive sensors in both probe heads measure the respective distances between the probe head surfaces and the wafer.

If there is foil applicated onto the wafer, the foil must be of high quality and its characteristics must be known by the PC-software.

For evaluating the data, E+H's versatile Windows software MXNT V2 is used.

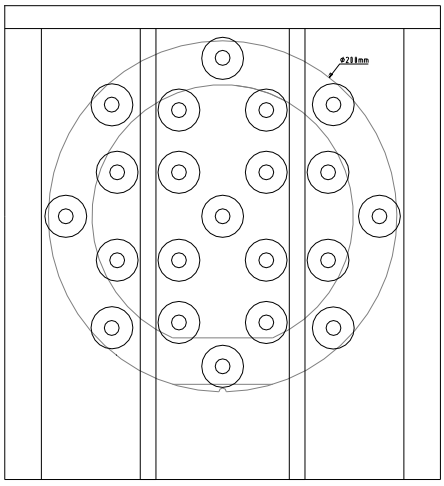


# 2 Technical Specifications

(at temperature of calibration)

| | | |
|---|---|---|
| Wafer Diameters | 150 | mm |
| | 200 | mm |
| Measuring Points | | |
| 150 mm Wafer | 13 | |
| 200 mm Wafer | 21 | |
| Measuring Time | 10 | sec / wafer |
| Cycle Time (incl. Movements) | 20 | sec / wafer |
| Sensor Characteristics | | |
| Distance Range | 0 to 3.275 | µm |
| Resolution (Thickness) | 0.1 | µm |
| Resolution (Warp) | 0.3 | µm |
| Thickness Measurement | | |
| Thickness Range | 100 to 760 | µm |
| Absolute Accuracy | ± 1.0 | µm |
| TTV Accuracy | ± 0.5 | µm |
| Repeatability (wafer still) | ± 0.3 | µm (1 σ) |
| Precision (including handling) | ± 0.5 | µm (1 σ) |
| Warp Measurement (w/o gravity correction) | | |
| Max. Allowed Warp (wafer thickness 100 to 300 µm) | 3000 | µm |
| Max. Allowed Warp (wafer thickness 300 to 400 µm) | 1000 | µm |
| Max. Allowed Warp (wafer thickness 400 to 700 µm) | 700 | µm |
| Max. Allowed Bottom Distance (wafer thickness 150 µm) | 3250 | µm |
| Accuracy | ± (3 | µm + 5% of reading) |
| Repeatability (wafer still) | ± (1 | µm + 1% of reading) |
| Precision (including handling) | | |
| 100 – 300 µm | ± (5 | µm + 5% of reading) |
| 300 – 700 µm | ± (2 | µm + 2% of reading) |
| Dimensions (w/o PC) | | |
| Width | 500 | mm |
| Depth | 600 | mm |
| Height 250 | | mm |

**Probe Head**



MX 204-8-21-V, issued 13 April 2004,
specifications subject to change without notice