E+H
Metrology GmbH

MX 1018

450mm High Resolution Wafer
Thickness and Flatness Gauge

(preliminary data sheet v.2)

1 Description

Based on established similar gauges for 4" to 300 mm wafers, the MX 1018 yields four (eight) radial profiles, each consiting of 450 thickness values. The gauges uses one pair of capacitive sensors having a resolution of 10 nanometers. Within a few seconds, it can be adapted to different thickness ranges. Before every scan, the gauge recalibrates itself automatically by means of a certified gauge block.

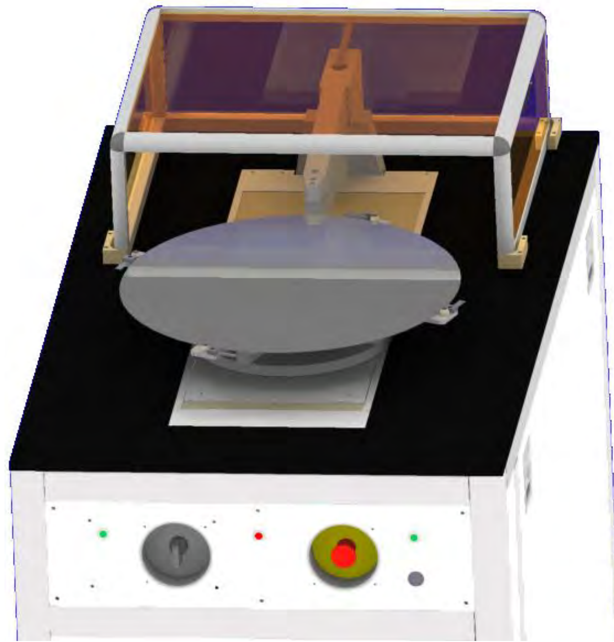


Fig. 1

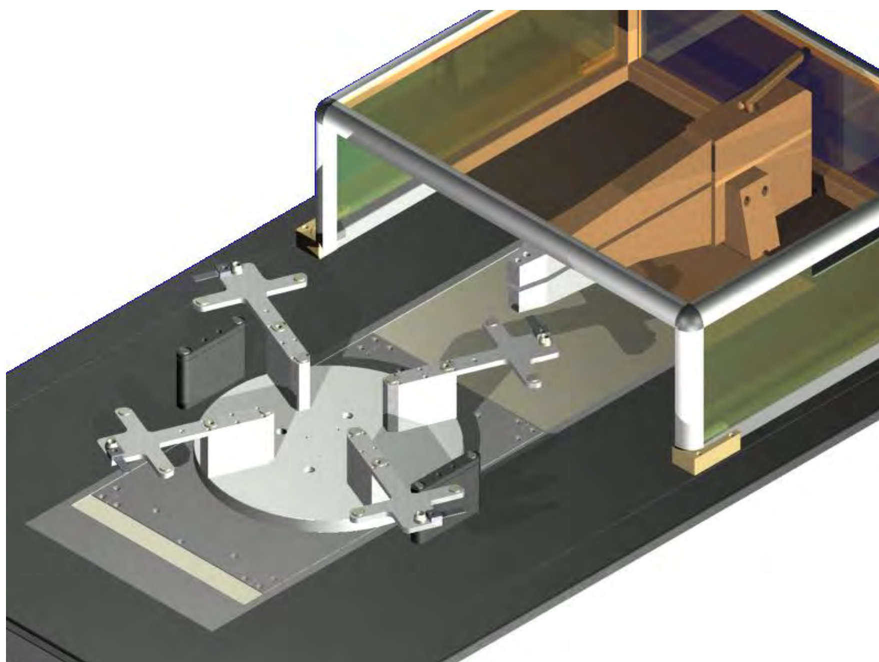
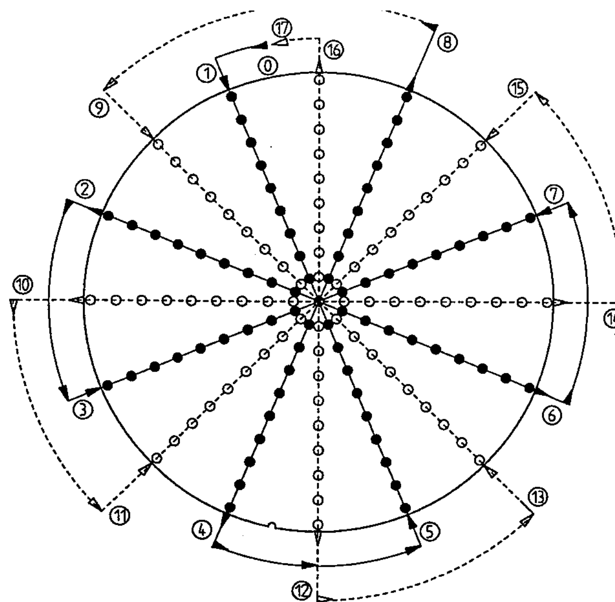


Fig. 2

Multiple Scans

The standard four radial scans are sufficient for many applications, especially for almost rotational symmetrical wafers after grinding. Theoretically, it might be possible to increase the number of scans so that almost 50 percent of the wafer area could be covered. The remaining area, however, lies in the ‘shadow’ of the four wafer supports. A simple additional movement solves this problem. After the first part of the measurement cycle, the wafer is raised and held by two pneumatic stamps while the turntable beneath the wafer performs a rotational movement of 22.5 degrees. After the wafer is lowered back to the supports and re-clamped by the vacuum chuck, the second part of the measurement cycle may begin, which will cover the remaining part of the wafer area. This, of course, increases the measurement time correspondingly.

The MX 1018 provides a compromise between resolution and throughput: the second scan cycle has an offset of 22.5 degrees, yielding eight cross scans with a total number of about 3500 measuring points. A simple three-dimensional graphic representation gives a global impression of the wafer’s geometry.

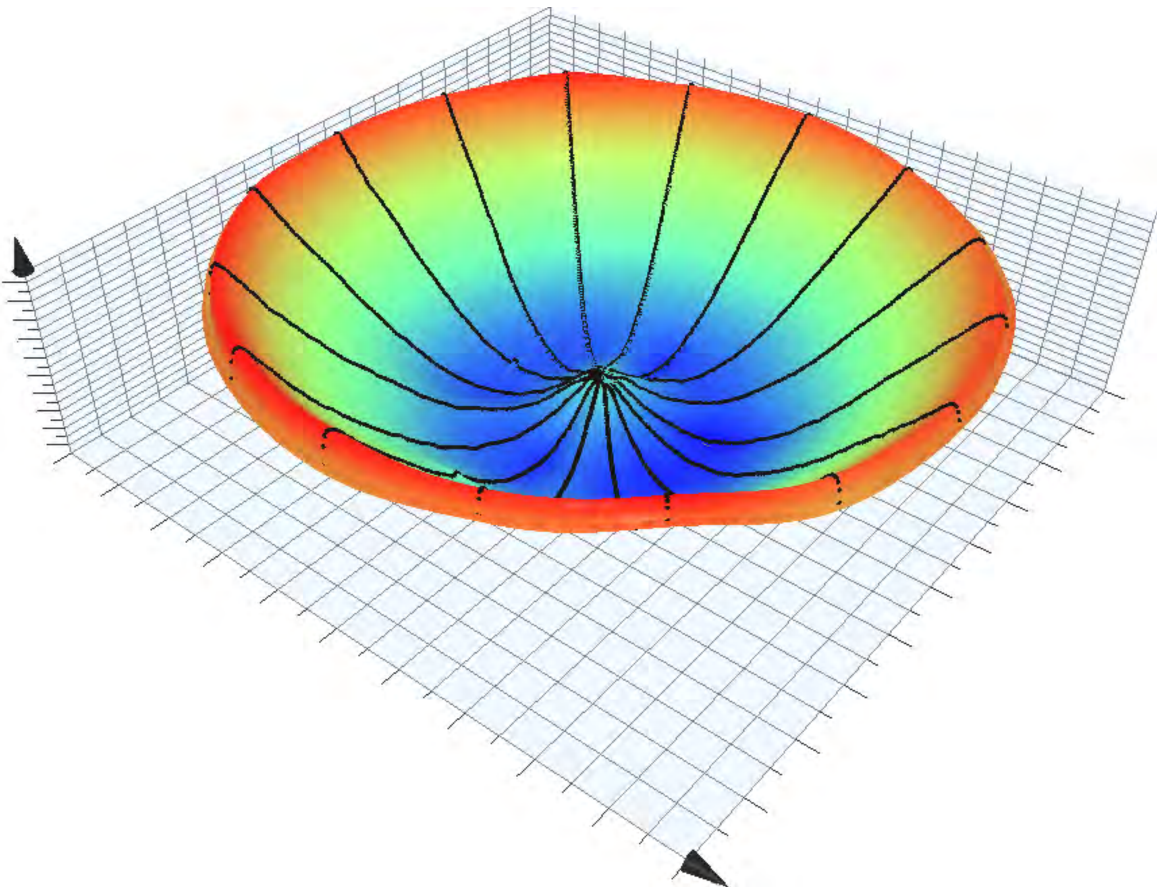


Extended Range Mode

This gauge type was originally designed for thickness measurements after the grinding or lapping processes. In these cases, the TTV of the wafers is small, and the resolution of the instrument is supposed to be high. There are other processes, however, especially after sawing or after backside grinding, where a higher thickness range is more important than a resolution of some nanometers. In the PC controlled setup, the measuring range of the instrument can be set to normal or extended.

2 Technical Specifications

Wafer diameters		450 and 300 mm
	Standard	Extended
Thickness dynamic ranges	± 50 µm	± 150 µm
TTV range	± 20 µm	± 40 µm
Resolution	10 nm	20 nm
TTV accuracy	± 50 nm	± 80 nm
Thickness accuracy	± 0.3 µm	± 0.5 µm
Active sensor		4 mm diameter
Spatial resolution		1 mm (overlapping)
Temperature range		18 - 28 °C
Cycle time		
450 mm, four scans		< 35 sec.
450 mm, eight scans		< 75 sec.



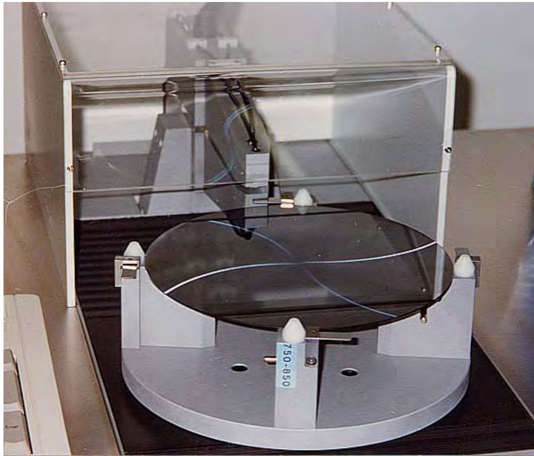


Fig. 4

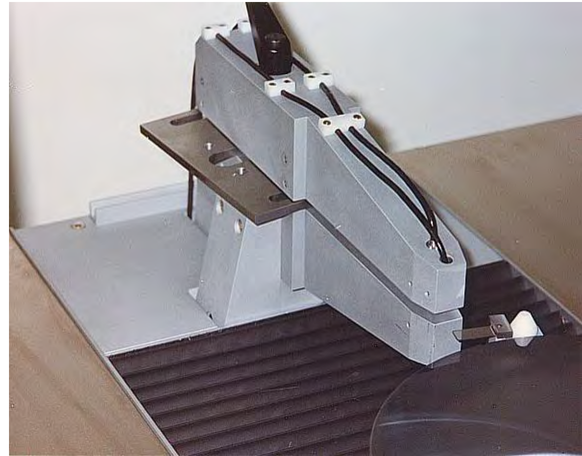


Fig. 5

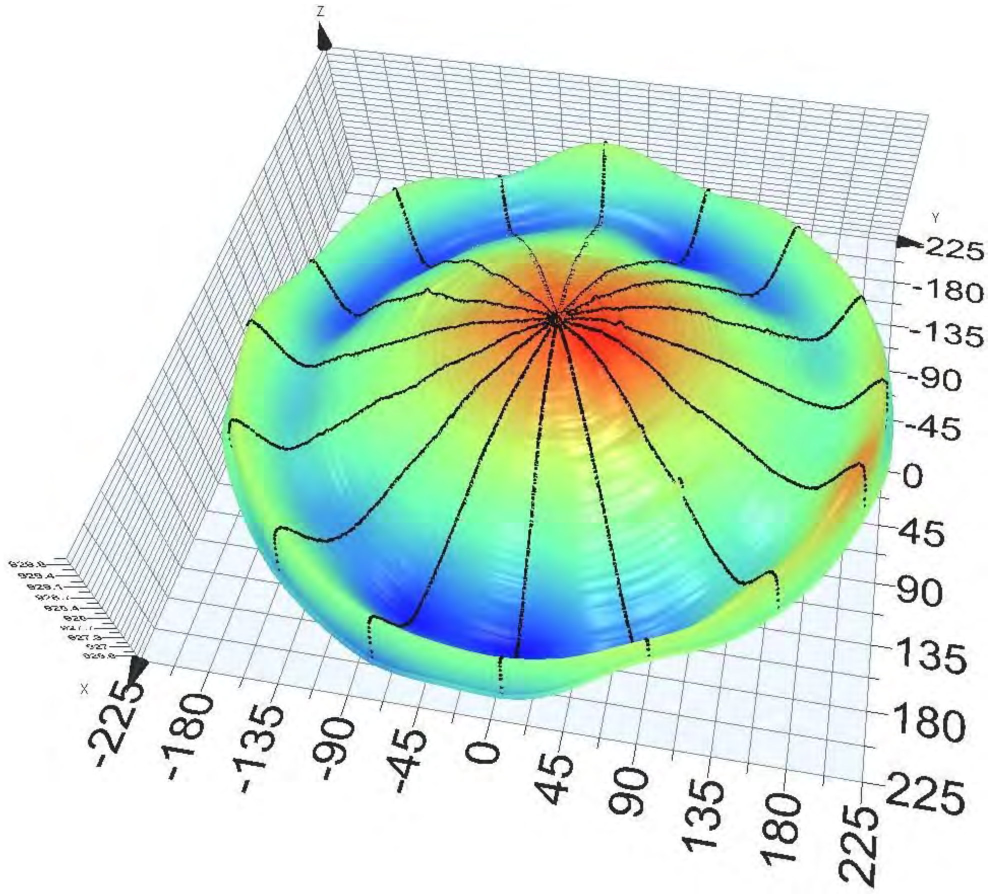
Operation and mechanical structure

During the measurement, the wafer rests on the tops of four posts which are mounted to a shiftable and rotatable round-table. The wafer can be brought to the loading position manually, or by means of a robot. It is centered there by a set of bolts with conical ends. The vacuum chuck pads which hold the wafer are made of PEEK and are ground over commonly, in order to provide a precise resting plane.

Upon measurement start, the vacuum chuck is activated. Depending on the selected thickness range, the remeasurement of the known thickness of one of four gauge block yields the zero-distance, i.e. the total distance between the two capacitive sensors facing each other. Then, the microprocessor controlled stepper motors insert the wafer radially into the air gap between the two sensors. There, at the very first measuring position, a 14-bit DAC measures the wafer thickness and compensates the electronic thickness signal to be measured in such a way that a fast ADC does only have to sample the signal variations relative to that reference point. This is done continuously, without stopping the wafer in motion. After the return of the stage to the origin position, the gauge block is finally measured again. The variation between this value and the first can be used to judge the overall success of the scan.

Figures 1 and 2 show the mechanical structure of the system. Figures 4 and 5 show the four gauge blocks and the exchangeable shim due to which the switching of the thickness range can be performed very quickly. These shims are coded that's why the corresponding gauge block is selected automatically. Figures 6 and 7 represent hardcopies made during two consecutive scans of the same wafer. They prove the very high repeatability of this device. The software permits to select different scales and offsets for the curves.

The MX 1018 is also available as a fully automated Robot system. Figure 3 shows for example a 300 mm system: MX 1012-RA-1C
(**R**obot with notch **A**ligner and **1** open **C**assette)



MX-NT - E+H

File Actions Scan Explorer View Acceptance tests EH Staff Debug & test functions Views Database System Tools Windows Help

450XN

Characteristics

FQA: 440.00
CntThk: 929.69
AvgThk: 928.48
TTV: 3.18

MX Device Reporter

Device structure | Substrate Tracker | MX 1012 | Infos & Errors | Course | Jobs

[17:58:42 #3161]: Job "EH054" accepted. Used recipe is "C:\EH_APP.1627\Mxnt2\Recipe\EH\PRO...

[18:00:04 #3228]: Job "EH054" has

Lot browser

Standard

Index	CntThk	MinThk	MaxThk	AvgThk	TTV	FQA	CLOCK
78	899.90	899.84	899.96	899.90	0.12	430.00	15.09.2008 16:48:1
79	900.03	899.99	900.09	900.03	0.10	430.00	15.09.2008 16:50:0
80	900.03	900.02	900.04	900.02	0.02	430.00	15.09.2008 17:15:4
81	899.94	899.94	899.94	899.94	0.00	430.00	15.09.2008 17:22:0
82	899.94	899.94	899.96	899.94	0.02	430.00	15.09.2008 17:28:0
83	899.94	899.94	899.96	899.94	0.02	430.00	15.09.2008 17:30:0
84	929.88	926.82	929.98	928.68	3.16	430.00	15.09.2008 17:45:2
85	900.07	900.06	900.08	900.06	0.02	440.00	15.09.2008 17:57:0
86	929.69	926.62	929.80	928.48	3.18	440.00	15.09.2008 18:00:0

LTHKScan values

Angles: 2.5°, 25.0°, 47.0°, 70.0°, 92.5°, 115.0°, 137.0°, 160.0°

Y axis: 931.8, 930.3, 928.8, 927.3, 925.7, 924.2

X axis: -202.5, -157.5, -112.5, -67.5, -45.0, 0.0, 22.5, 45.0, 67.5, 90.0, 135.0, 180.0

MX 1012 Online / Idle

Device is in IDLE state. Ready for work.