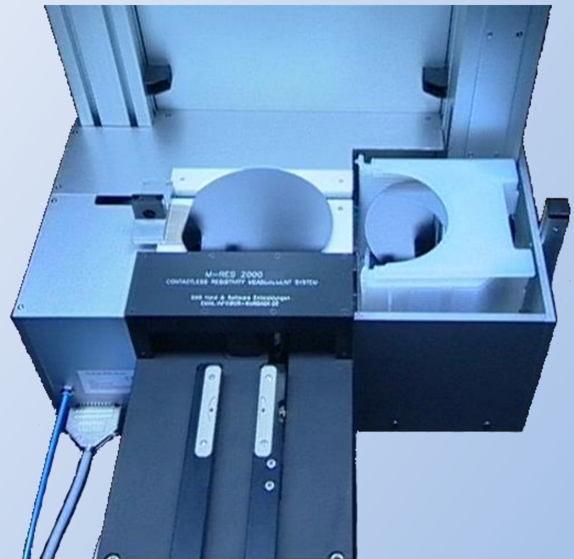
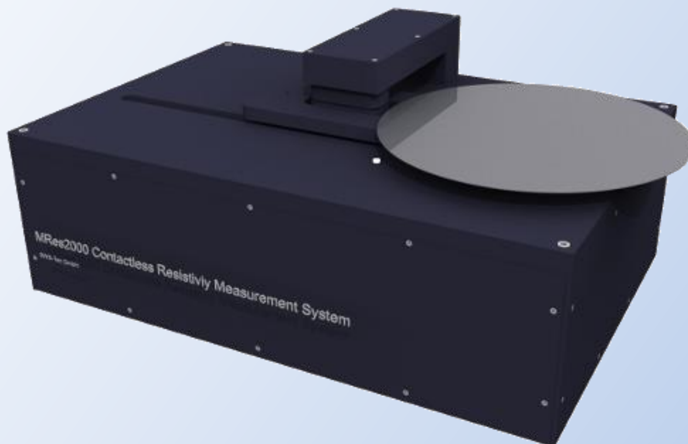
M – RES 2000

Advanced – Non Contact Resistivity Measurement
for Wafer Sizes from 2“ up to 300mm
including Automatic Wafer Thickness Measurement and Compensation





Advanced eddy current measurement technology
Precision resistance measurements and resistivity measurements
Available models:

- Manually loaded and operated
- Manually loaded with mapping function
- Automatically loaded with mapping function
- Automatically loaded with mapping and sorting function

Wafer conductivity type monitor (option)
Lifetime measurements (option)

1. Measurement Principle

The Eddy Current method was founded around 30 years ago by Mr. G. L. Miller from Bell Labs, U.S.A. Mr. Miller discovered the relation of the resistance of a sample to the power difference of a high frequency circuit where a coil generating a high frequency magnetic field. The general method is documented in a paper from Mr. Miller - (G.L. Miller, D.A.H. Robinson, and J.D. Wiley, "Contactless measurement of semiconductor conductivity by radio frequency-free-carrier power absorption", Rev. Sci. Instrum., Vol. 47 (1976).

2. Applications

Other than contact methods such a the 4-Point-Probe with touching the sample surface and suffering from the surface conditions as well as from the conditions of the probes itself, the Eddy Current principle is a non-contact measurement method and hence non-destructive. It is independent from the surface and can even be used with non-conductive layers on the surface of the sample. Since the Eddy Current principle is non-contact there is no cross contamination which is the case of contact methods as well as there are no cost of ownership from probes.

The ***M-RES 2000*** resistance and resistivity measurement systems operate using the Advanced Eddy Current principle.This measurement principle also takes the wafer thickness conditions in account which allow to measure even wafers with bow.

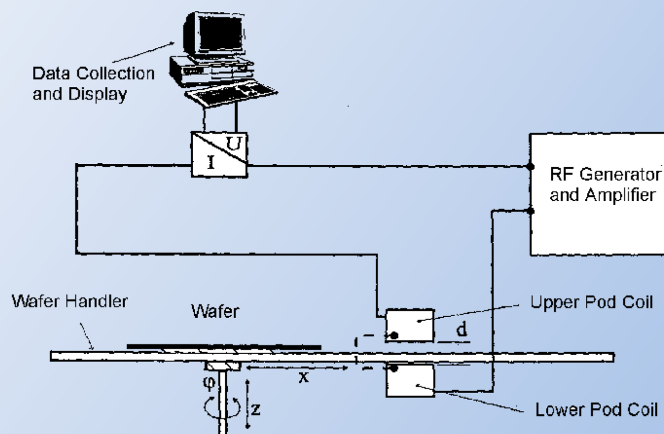
The Eddy Current principle

- is non-destructive as it does not touch the sample
- does not require any sample preparation. It can make measure samples even if they are coated with non-conductive layers or films such as Oxide, laminated or similar materials.
- can measure on polished surfaces as well as on rough surfaces
- does not require preventive maintenance
- does not have any consumables.

Different applications are known so far including the measurement of process layers such as EPI and Implantation as well as diffusion and also metallization and bulk resistivity.

Although the Eddy Current principle is not depth discriminating, it is the choice method to measure product samples and provide the true conditions of the process rather than using monitor samples trying to project the process conditions back to the product.

3. System Configuration



With the experience of many years developing and designing Eddy Current circuits, this experience is being used to design and build the resistance and resistivity measurement systems series ***M-RES 2000***.

Special attention has been paid on selecting the ferrite material for the coils as well as the design of the coils. The perfect matching of the high frequency circuit is the key for the outstanding measurement reliability.

Two basic configurations are available to handle wafers from 2“ up to 200mm of diameter and also from 100mm up to 300mm of diameter. The systems are equipped with measurement capabilities to match the application. Two ranges are to cover 6 orders of magnitude (Factor: 1,000,000).

A computer is provided with the system in order to collect the measurement data and to visualize the data for the better understanding of the uniformity of the sample in case of using the mapping systems. The computer can also connect to the network with the measurement data available for the general production monitoring.

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M-RES 2000

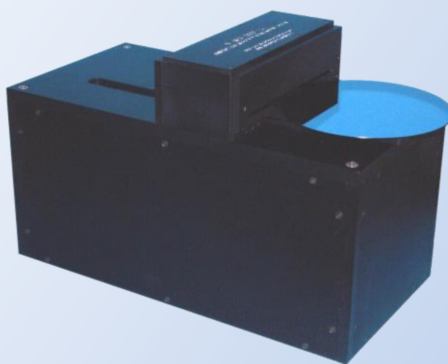
Manually operated system with the wafer being manually loaded onto the wafer shuttle. The solid handle in front of the system is being used to move the shuttle with the wafer to the measurement position. The ruler on the front plate can be used for positioning the wafer. The ruler has a notch at the center of the wafer to the Eddy Current coil.

M-RES 2000-300

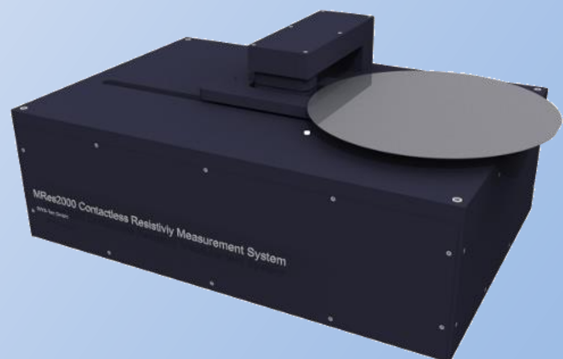
Measurement Range	0.0065 Ωcm* through 6,500 Ωcm* (typical Setup) (automatic thickness compensation) Other setup configurations available Special setup: up to 25.000 Ω-cm*	*Wafer thickness 650µm No wafer thickness related calibration required.
Repeatability	Typical <0.5% (10 center measurements, same position of the sample)	
Linearity	<0.5%	
Thickness	100µm through 1.900µm Other setup configurations available	
Tool-to-Tool	<1%	
Conductivity Type (Option)	10 mΩ-cm through 1.000 Ω-cm	
Environment / Operating Temperature	18°C through 28°C Drift <2°/h	
Footprint	W/D mm M-RES 2000: 450x350 / M-RES 2000-300: 600x400	
Power Supply	95 – 230 VAC 50/60Hz	

M-RES 2000M

Manually loaded system with automatic wafer mapping capability.



M-RES 2000M



M-RES 2000M-300

Measurement Range	0.0065 Ωcm* through 6,500 Ωcm* (typical Setup) (automatic thickness compensation) Other setup configurations available Special setup: up to 25.000 Ω-cm*	*Wafer thickness 650µm No wafer thickness related calibration required.
Repeatability	Typical <0.5% (10 center measurements, same position of the sample)	
Linearity	<0.5%	
Thickness	100µm through 1.900µm Other setup configurations available	
Tool-to-Tool	<1%	
Throughput	Center Point: >500W/h - 9 Point >150 W/H - 49 Point > 25 W/h	
Conductivity Type (Option)	10 mΩ-cm through 1.000 Ω-cm	
Environment / Operating Temperature	18°C through 28°C Drift <2°/h	
Footprint	W/D M-RES 2000M: 375x190 / M-RES 2000M-200: 425x240 / M-RES 2000M-300: 600x400	
Power Supply	95 – 230 VAC 50/60Hz	

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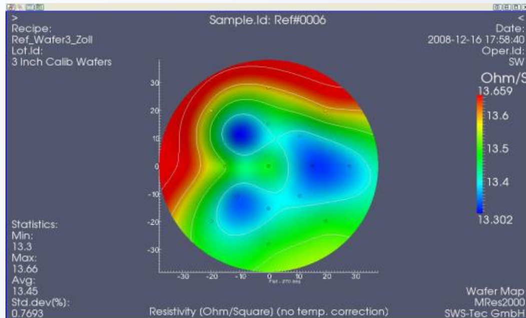
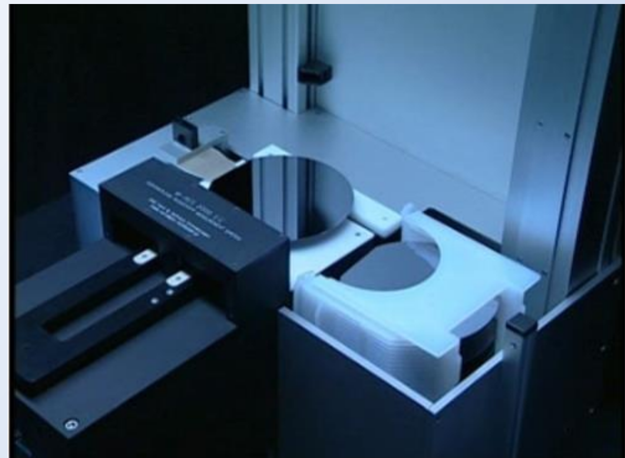
M-RES 2000M-AL

Automatically loaded system with automatic wafer mapping capability. Tabletop system configured with the measurement module ***M-RES 2000M*** mounted to the cassette-to-cassette wafer loader with integrated wafer aligner.

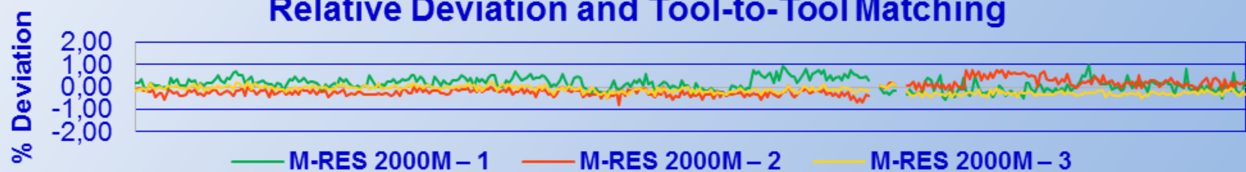


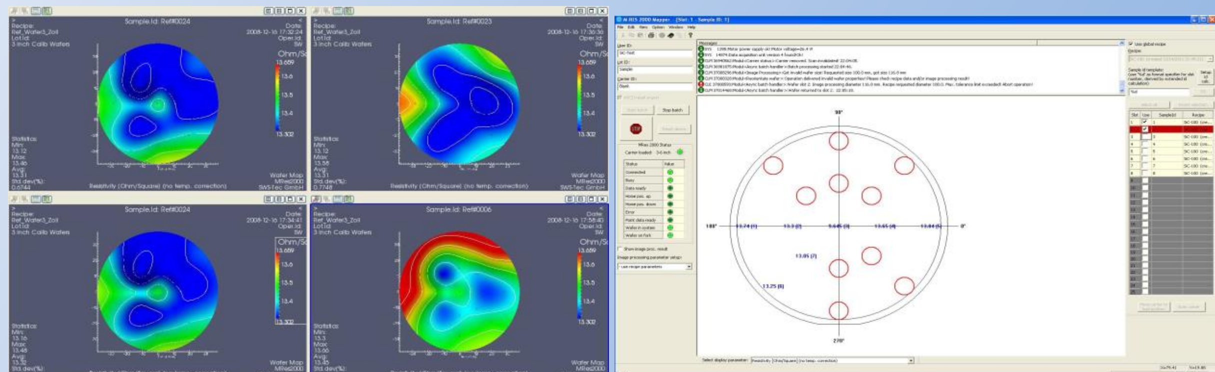
Wafer Mapping



M-RES 2000M-AL

Measurement Range	0.0065 Ωcm* through 6,500 Ωcm* (typical Setup) (automatic thickness compensation) Other setup configurations available Special setup: up to 25.000 Ω-cm*	*Wafer thickness 650µm No wafer thickness related calibration required.
Repeatability	Typical <0.5% (10 center measurements, same position of the sample)	
Linearity	<0.5%	
Thickness	100µm through 1.900µm Other Setup configurations available	
Tool-to-Tool	<1%	
Throughput including Alignment	Center Point: > 100 W/h - 9 Point >70 W/h - 49 Point > 20 W/h	
Conductivity Type (Option)	10 mΩ-cm through 1.000 Ω-cm	
Environment / Operating Temperature	18°C through 28°C Drift <2°/h	
Footprint	W/D mm - M-RES 2000M-AL: 520x500 / M-RES 2000M-200-AL: 570x550	
Power Supply	95 – 230 VAC 50/60Hz	





3D Graphics - Run-2-Run **2D Test Result with Cassette Mapping**

Specifications subject to change without notice

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