

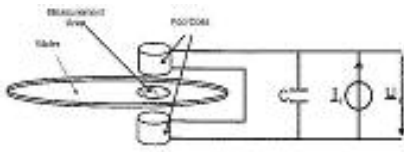
M – RES 2000

Non Destructive – Non Contact Resistivity Measurement



- **Series of systems to measure wafers from 2" up to 300mm**
- **Manual and automatic systems including scanning and mapping capability**
- **Automatic wafer handling and sorting systems**
- **Wafer thickness measurement**
- **Automatic wafer thickness resistivity correction**
- **Wafer conductivity type monitor (option)**

1. Measurement Principle



The resistivity measurement systems series **M-RES 2000** uses the Eddy Current principle to determine the resistivity of the measured sample. As shown in the picture, a gap is formed by two pod coils which are powered by RF. With the sample moved into the gap, the magnetic field of the pod coils is generating an

Eddy Current in the conductive layer of the sample. This Eddy Current is dragging power from the RF generator. This power loss is proportional to the conductivity of the sample.

2. Applications

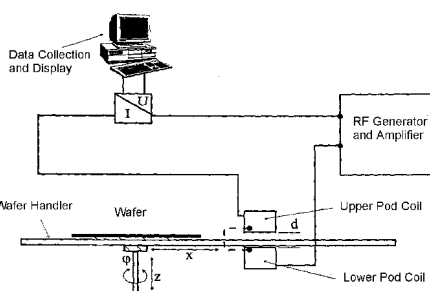
The Eddy Current principle is a non-contact measurement method and hence non-destructive. It is the ideal method to measure product samples and provide the true conditions of the process rather than using monitor samples trying to project the process conditions back to the product. It has been proven that the **M-RES 2000** resistivity measurement systems provides reliable and precise measurements in order to improve the yield. Different applications are known so far including the measurement of process layers such as EPI and Implantation on compound semiconductors but also metallization and bulk resistances. Although the Eddy Current principle is not depth discriminating, it is the choice method to measure thin layers such as thin metal layers even if the layer is deposited on conductive substrates. The **M-RES 2000** non-contact resistivity measurement systems provide correction features to isolate the metal layer resistivity. In addition to these features, the Eddy Current principle of the **M-RES 2000** series can measure the resistivity of samples even if they are covered by an isolating top layer.

The measurement technology of the **M-RES 2000** resistivity measurement systems has been developed to provide the capability to measure samples from $\mu\text{Ohm/sq}$ up to more than $100,000 \text{ Ohm/sq}$. This measurement technology is independent of the surface and allows to measure even on polished samples.

A special measurement method has been developed for the **M-RES 2000** resistivity measurement systems in order to provide the correct resistivity independent of the sample thickness. This is an important feature for all applications with samples varying in thickness from one sample to the other.

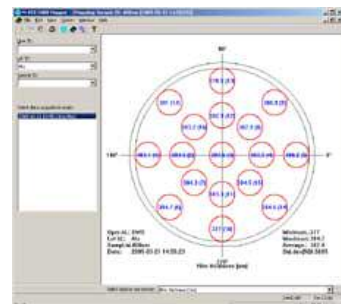
An option may be built into the **M-RES 2000** resistivity measurement system series offering non-contact measurements of the conductivity type of the sample and correction functions to correct for the temperature according to ASTM.

3. System Configuration



reduced precision. The compactly designed measurement system is connected through a serial RS-232 interface to the host computer. The software with human interface screens for the **M-RES 2000** measurement system is collecting and saving the measurement data.

The non-destructive and non-contact **M-RES 2000** resistivity measurement systems series is available in different configurations with two general configurations, one for wafers with diameters from 2" through 200mm and the other for wafers with diameters from 150mm through 300mm. The measurement range of each system is up to 6 decades with two ranges of high precision and a wider range with



3. System Configuration - continued

The handling of the wafers can be performed manually for laboratory applications or can be computer controlled with scanning or even mapping capability. The **M-RES 2000** is also available with integrated robotic wafer handling. The robot system is available with two (2) cassette stations which may be configured as required, including sorting capability. Also, complex sorting systems may be configured on request. The robot is equipped with double-end effector for high throughput operation.

The model **M-RES 2000HR** is specially designed to measure wafers with a resistivity as high as 25,000 Ohm-cm which is corresponding to 500,000 Ohm/sq

4. System Operation and Specifications



M-RES 2000

The non-destructive and non-contact measurement systems series **M-RES 2000** uses the Eddy Current method in order to determine the resistivity of conductive samples. The sample is placed on a linear wafer handler which is moving the wafer into the gap of the measurement system. The system may be equipped with one or with two measurement ranges. The measurement range is selected automatically at the moment the sample is entering into the measurement gap. If the optional conductivity type monitor is installed, the conduc-

tivity type is also monitored at this moment. The measurement system includes several correction functions in order to correct for temperatures as well as for different wafer thickness and conductive layers on the wafer. The temperature correction is available as a linear function with just one temperature coefficient and also the temperature correction for silicon according to ASTM. These functions are important for all applications with silicon wafers of different thickness including the temperature correction related to the conductivity type.

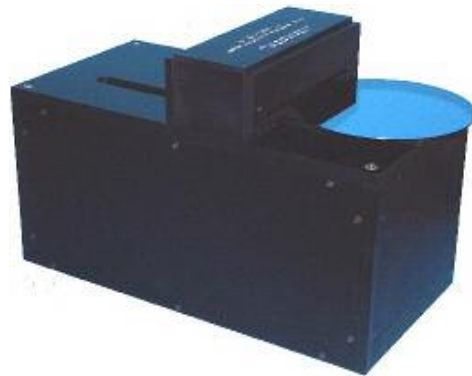
The **M-RES 2000** measurement systems series is compactly designed with all electronic components in the main cabinet of the system.

The operation of the system is controlled by the software supplied with the system. A single screen for the operation of the system provides all relevant information of the measurement, which is automatically saved in the log-file. The measurement data may also be saved in customized files for batches or individual wafers.

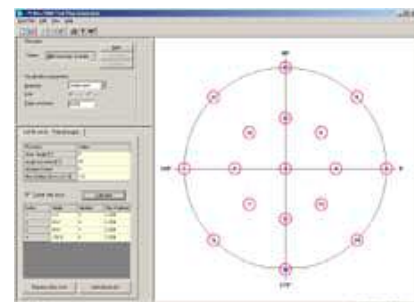
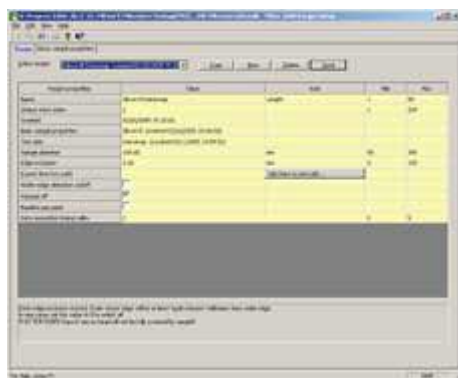
For measurement systems with scanning or mapping capabilities, additional screens allow the setup of individual test plans and recipes to run the test of the wafers or the test of the selected wafers of the cassette.

Material data may be entered to compensate for specific features such as thin metal layers or conductive layers on isolating substrates.

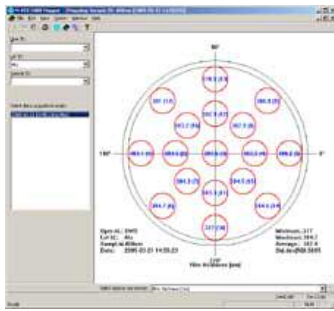
The operator interface is kept as simple as possible to select the required recipe and to enter the sample and lot identifications, which are used to identify the measurement in the history.



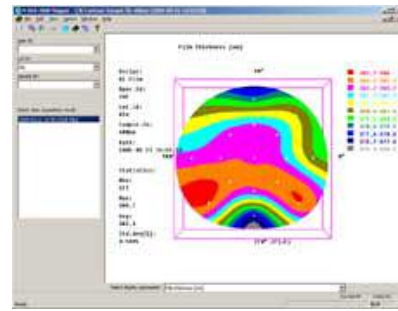
M-RES 2000M



4. System Operation and Specifications – continued



All screens, the 2D test result screen, the 3D test result and also the contour test result screen, include the statistical data of the sample. Lot and lot to lot statistical information is available on the automatically operating non-destructive and



non-contact **M-RES 2000** resistivity measurement systems.

Two different calibration functions for the resistivity and the thickness are provided with the configuration module of the software. One of the calibration functions is a regular two point calibration with one reference point in relation to the base point while the other calibration function offers a three point calibration in relation to the base point.

Specifications

All specifications are related to adjustments and measurements using NIST traceable uniformly doped silicon standards.

Measurement Rang	Single range system 3 decades Dual range system 6 decades Total range selected within 50 $\mu\Omega/\text{sq}$ through 100.000 Ω/sq Special Setup: up to 500.000 Ω/sq Adjusted to the application
Repeatability	< $\pm 1\%$ (at 100.000 Ω/sq < $\pm 10\%$) (10 center measurements, same position of the sample)
Linearity	<0.5%
Thickness	150 μm through 900 μm
Measurement Gap	1.5mm
Conductivity Type (Option)	10 m $\Omega\text{-cm}$ through 1.000 $\Omega\text{-cm}$
Environment	
Operating Temperat	18°C through 28°C
Temperature Stability	Drift <2°/h
Power Supply	95 – 230 VAC 50/60Hz

5. Related Measurement Systems



M-RES 2000OEM is the measurement technology for the integration into tools and cluster systems.



LCD-R resistivity measurement systems for in-line measurement of large panels. The system is being built into the conveyor system of the coating system or even into the vacuum chamber.

PV-R In-line resistivity and thickness measurements for solar substrates and diffusion processes.

Semipol is a highly sensitive P/N measurement system. Detecting the conductivity type of silicon wafers to the limits of low resistances.

Specifications subject to change without notice

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