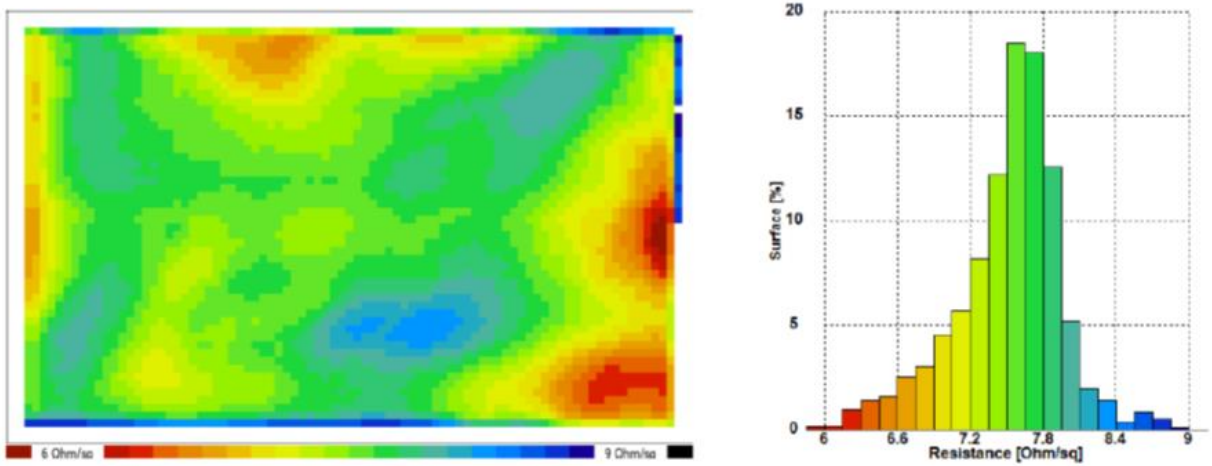
# T28 Non contact Sheet Resistance by Eddy Current - SEMILAB

TEESMAT
Open Innovation Test Bed for Electrochemical Energy Storage Materials

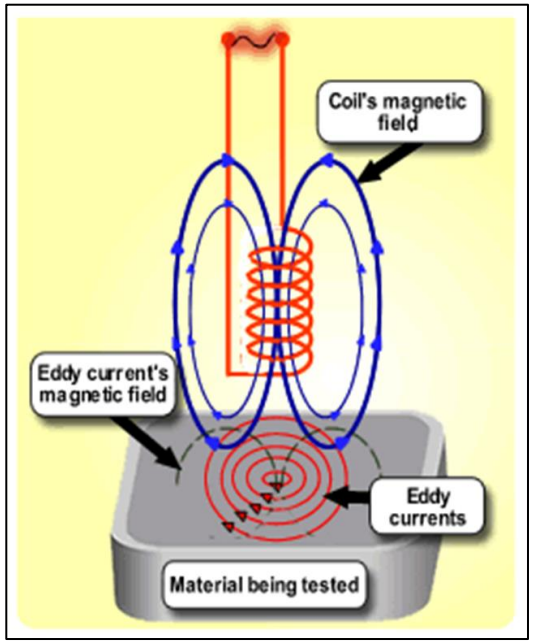
## How it works

Eddy current measurement is based on flow of AC current in a coil. Generated magnetic field induces circulating (Eddy) currents in the sample. The Eddy current measurement actually serves for obtaining of the electrical loss in the material. Because the measured signal depends on sample sheet resistance, and distance between the probe and sample, **the true sheet resistance values can be obtained from the distance value and the Eddy signal.**

## What can be seen ?




A4 size. Sheet resistance of conductive printed layer on Kapton foil




Eddy current principle

Investigation time-scale : days / weeks

Maturity level : advanced

Grant Agreement
No 814106

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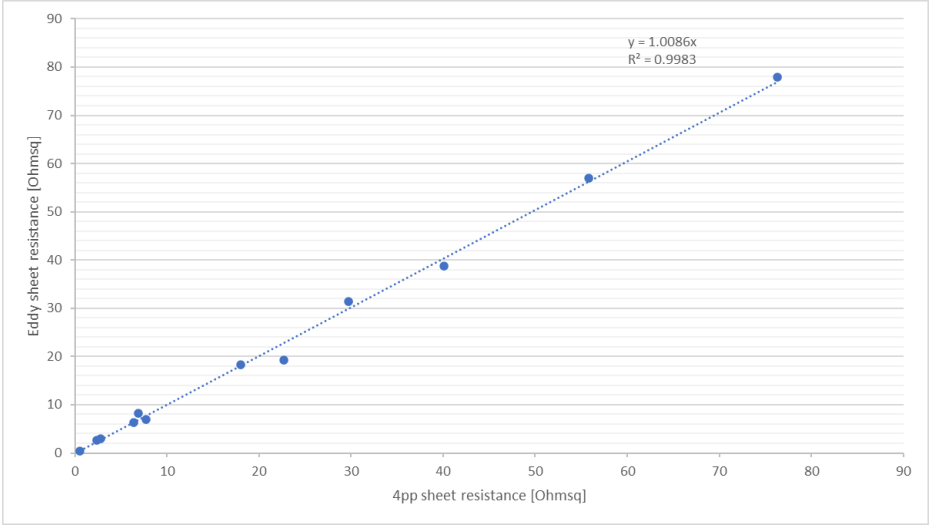
What kind of sample ? Any size larger than 10 mm. The upper limit of the measurable sheet resistance is 500 Ohm/sq. The substrate has to be an insulator.

## Why is it useful ?

Eddy current can be useful in **process developpment** at the R&D phase to control the Sheet resistance of various materials and process conditions but also at the **production control** phase as this method is very **fast and non contac**t. Stability proven in production, accuracy is also achieved by calibration and comparison to standard methods of sheet resistance determination like 4 Point probe.




Sheet resistance measurement correlation with 4PP

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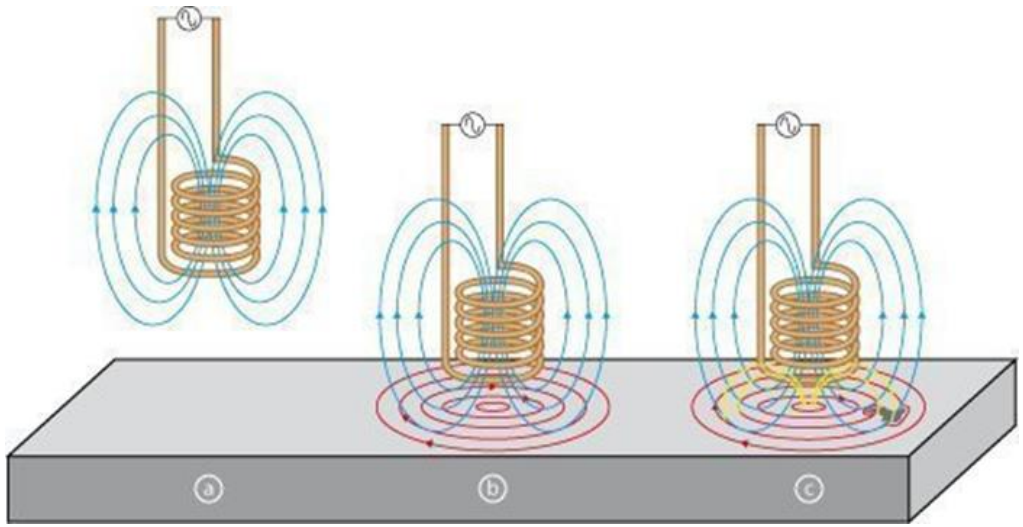
## More details….

The measured signal depends on

- **The Resistivity of the material in case of semi-infinite samples as blocks or**
- **The Resistivity and thickness, in case of samples with finite thickness as wafers or**
- **The Sheet resistance, in case of thin layers and**
- **The Distance between the coil and sample**

The resistivity or the sheet resistance is to be measured, so the distance dependence has to be eliminated by independent distance measurement using another probe , a distance sensor (based on capacitance measurement) applied to get the necessary distance information. Distance sensor and eddy sensor are coaxial and measure in the same spot, from the distance value and the eddy signal.

**The Eddy current is higher in good conducting material compared to less conductive ones**.



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**FEATURES**

- Non-contact, non-destructive method
- Alternative method to the traditional four-point-probe
- Sample preparation free
- Capable of full mapping (with 10 mm edge exclusion) with very fast tact time
- With certain limitations measurement is possible even on partly metallized panel

**Eddy current can also be used for certain metal thickness measurements such as identifying corrosion under aircraft skin, to measure conductivity and monitor the effects of heat treatment**, and to determine the thickness of nonconductive coatings over conductive substrates. Both field portable and fixed system instruments are available to meet a wide variety of test needs.

**Eddy current can examine large areas very quickly**. At the same time, eddy current testing is limited to materials that conduct electricity and thus cannot be used on plastics. In some cases, eddy current and ultrasonic testing are used together as complementary techniques, with eddy current having an advantage for quick surface testing and ultrasonics having better depth penetration.

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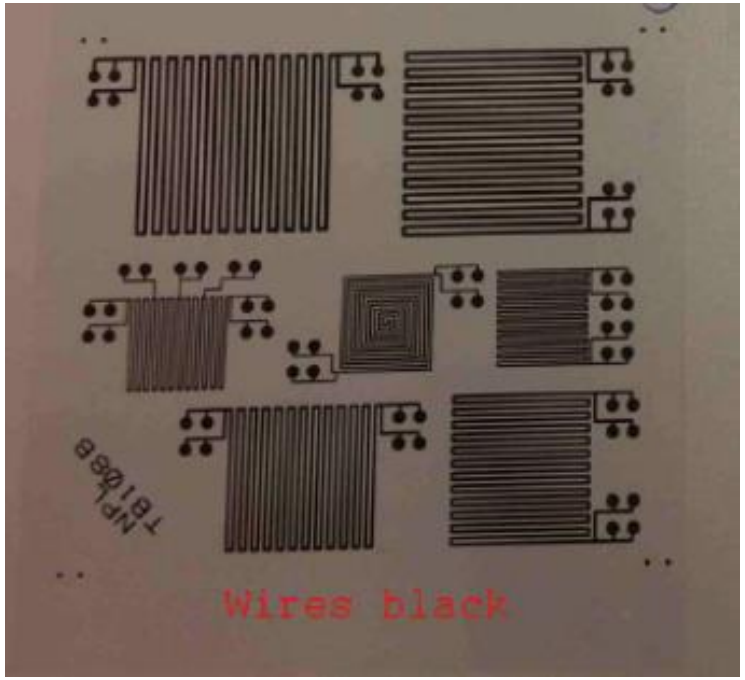
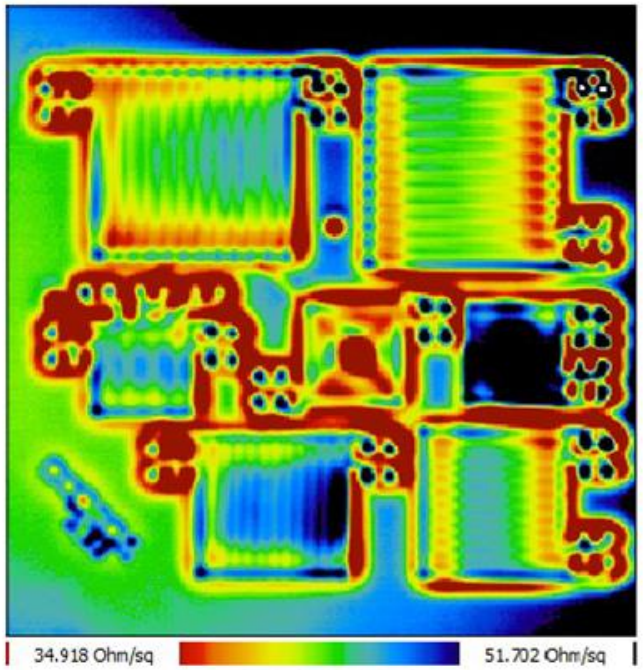
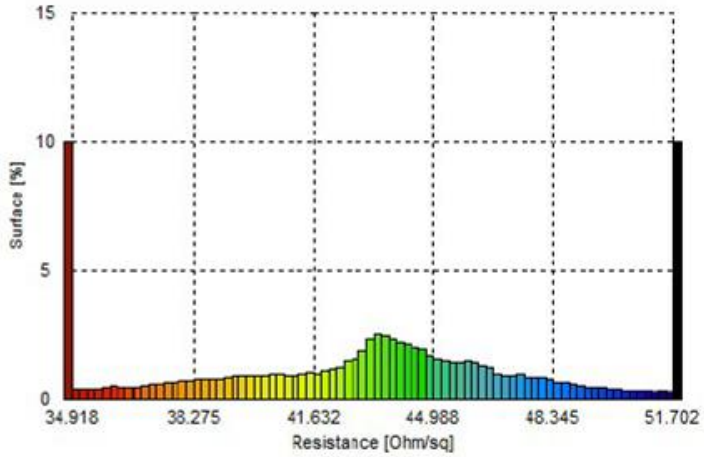



Average: 43.452 Ohm/sq
Median: 43.648 Ohm/sq
Deviation: 15.537%
Minimum: 16.586 Ohm/sq
Maximum: 87.422 Ohm/sq




Sheet resistance by Eddy Current of Printed Copper wires on PET,