



Highlights

- ▶ Contact free & real time
- ▶ Accurate single-point measurement of isotropic and anisotropic films
- ▶ Manual software guided mapping

Parameters

- ▶ Sheet resistance (Ohm/sq)
- ▶ Metal layer thickness (nm, μm)
- ▶ Metal substrate thickness (μm)
- ▶ Anisotropy
- ▶ Defects
- ▶ Integrity assessment

Applications

- ▶ Architectural glass (LowE)
- ▶ Touch screens and flat monitors
- ▶ OLED and LED applications
- ▶ Smart-glass applications
- ▶ Transparent antistatic foils
- ▶ Photovoltaics
- ▶ Semiconductors
- ▶ De-icing and heating applications
- ▶ Batteries and fuel cells
- ▶ Packaging materials

Materials

- ▶ Metal films and meshes
- ▶ Conductive oxides
- ▶ Nanowire films
- ▶ Graphene, CNT, Graphite
- ▶ Printed films
- ▶ Conductive polymers (PEDOT:PSS)
- ▶ Other conductive films and materials

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Innovation Award by
Free State of Saxony 2013
1st Place

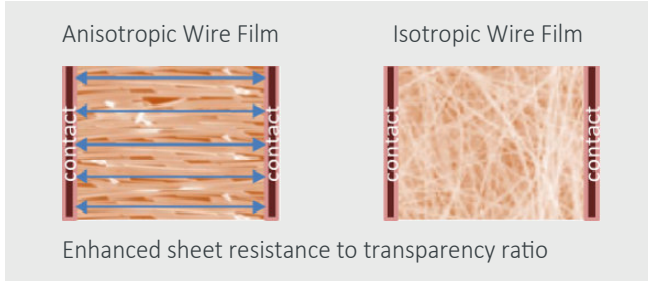


Anisotropy Term and Concept

- ▶ Sheet resistance anisotropy refers to a difference in electrical resistivity measured parallel and perpendicular to the machine direction
- ▶ Many wire and mesh structures can have an anisotropic sheet resistance

Electrical anisotropy...

- ▶ ... can be optimized according to the layout of the contact pattern
- ▶ ... can save material and improve optical transparency
- ▶ ... can be measured in contact or non-contact mode by EddyCus® TF lab 4040 SR-A or EddyCus® TF inline anisotropy devices



Anisotropy Term and Concept

$$\text{Anisotropy Ratio} = \frac{R_{TD}}{R_{MD}} \quad \text{Anisotropy [\%]} = \frac{R_{TD} - R_{MD}}{0.5 (R_{TD} + R_{MD})}$$



Measurement technology	Non-contact eddy current sensor
Substrates	e.g. Foils, glass, wafer, etc.
Substrate area	29.5 x 25.6 inch / 750 x 650 mm (for 400 x 400 mm samples)
Max. Sample thickness / sensor gap	1 / 2 / 5 / 10 / 25 mm (defined by the thickest sample)
Sheet resistance range	Standard 0.001 - 500 Ohm / sq; 1 to 5 % accuracy
Thickness measurement of metal films (e.g. copper)	2 nm - 2 mm (in accordance with sheet resistance)
Device dimension (w/l/h) / weight	30 x 12 x 26 inch / 760 x 310 x 660 mm / 20 kg
Available features	Sheet resistance anisotropy sensor Optical transparency

Software and Handling - EddyCus® TF lab Control

EddyCus® TF lab Control SURAGUS®

Status: Measuring TempOk OK

Configuration:

- Measurement Type: Sheet Resistance
- Sample Size: 200 mm
- Sample Thickness: 1.5 to 3 mm
- Measurement Range: 0.3 to 300 Ω/sq

Real Time Measurement:

- Mode: Anisotropy
- Machine Direction: 49.47 % (55.07 Ω/sq)
- Traverse Direction: 50.53 % (56.25 Ω/sq)
- Machine Anisotropy: 4.24 Percent
- Set No of Digits: 0.00

Data Tracker:

Series Name: SilverNanoWire#7

Add	Id	Time	Series Name	Value	Unit
<input checked="" type="checkbox"/>	1	11:13:43 AM	SilverNanoWire#1	8.77	Percent
<input checked="" type="checkbox"/>	2	11:14:49 AM	SilverNanoWire#2	10.39	Percent
<input checked="" type="checkbox"/>	3	11:15:21 AM	SilverNanoWire#3	23.35	Percent
<input checked="" type="checkbox"/>	4	11:15:35 AM	SilverNanoWire#4	18.23	Percent
<input checked="" type="checkbox"/>	5	11:15:52 AM	SilverNanoWire#5	27.21	Percent
<input checked="" type="checkbox"/>	6	11:16:08 AM	SilverNanoWire#6	27.71	Percent
<input checked="" type="checkbox"/>	7	11:16:39 AM	SilverNanoWire#7	4.24	Percent

Graph showing Percent vs Id. A callout for Id=6 shows a value of 27.71.