Corona charge
Non-contact Ultra high sheet resistance measuring instrument

Model CRN-100

Specifications

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Ver. 1.01

February, 2016

１． Outline

Model CRN-100 measures ultra-high sheet resistance(10^9～10^{15}Ω/sq) ‘for thin-films and/or substrates on X-Y automatic probing sage by corona charge without contact.

Model CRN-100 is suitable for a research and development of materials or thin films (e.g. a-Si, IGZO or poly-silicon) of the ultra-high sheet resistance, quality controls of the process of manufacture.

２． Features

1. Measurement by Corona charge method（Patent No.5510629）

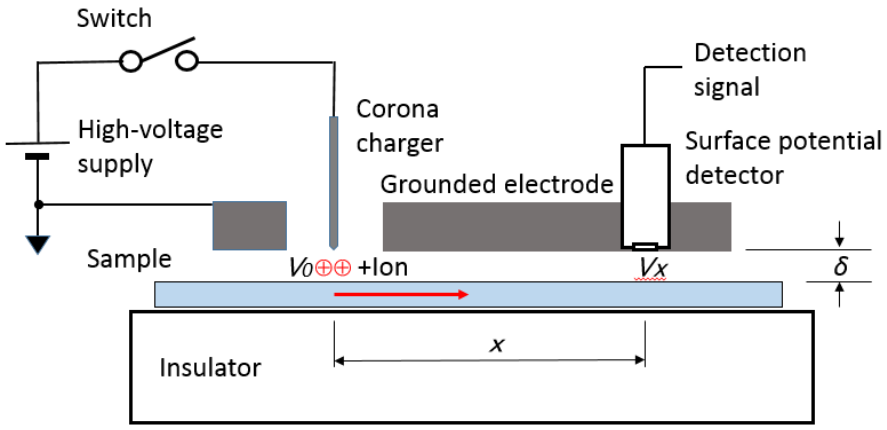
＊ Non-contact Measurement for Ultra-high sheet resistance（10^9～10^{15}Ω/sq）

＊ Easy operation by Windows

＊ Safety design

3． Measurement principle

It shows the non-contact measurement principle by corona charge method.



(Measurement principle)

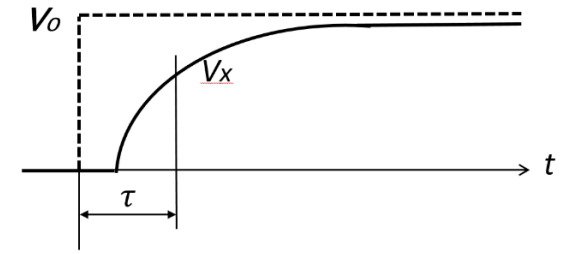
Apply a plus high-voltage to the corona charger with closing the switch, then it makes corona charge around the edge of the electrode then it will generate plus-ion.
Surface of the sample takes charge by supplying the plus ion.
Then control the surface potential of the sample located just below the Corona charger constant, and measure the change of the surface potential at the position of distant X, and acquire the value of sheet resistance by the changing speed.

The following formula shows that the surface potential V(x,t) after t seconds from Switch is turned ON at the position of distant X from just below the Corona charger.

$$V(x,t) = V_0\left(1 - erf\left(\sqrt{\frac{\varepsilon_0 \rho_s}{4t\delta}}x\right)\right)$$

V_0 : Sample surface potential where just under the corona charger
Vx : Surface potential where x away from just under the corona charger
δ : Gap between sample surface and grounded electrode
x : Distance between the position just under the corona charger and the position just under the surface potential detector
ρs : Sample Sheet resistance
ε_0 : Permittivity of air
erf : Error function of gauss

It shows the response characteristics between samples surface potential $V_{0\,just}$ under the corona charger and surface potential Vx away from distant x.



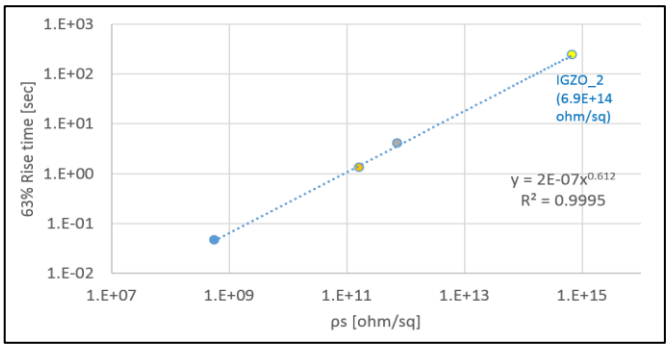
(Response characteristics of V_o and Vx)

τ : Rising Time of Vx until it reaches the designated potential after the switch is turned ON.

The calibration curve of the rising time and sheet resistance is created by measuring the standard resistance samples（it needs a few pieces of 10^9～10^{15} Ω/sq）.
Standard samples decide the resistance by measuring with ring probe, 2-point probe and 4-point probe.

The precision of the absolute value of the sheet resistance by a Corona charge method, and it depends on the reference sample used for calibration.

If the sample's sheet resistance is unknown, measure the rise time by corona charge method, and calibrate the sheet resistance by calibration curve.



(Rise time/Sheet resistance calibration curve)

4． Configuration

4-1 Corona charge method Sheet resistance measurement unit 1 unit

4-2 X-Y-Z axes automatic probing stage 1 unit

4-3 Ionizer 1 unit

4-4 Measurement stage 1 unit

4-5 Temperature sensor 1 unit

4-6 Humidity sensor 1 unit

4-8 High speed A/D convertor 1 unit

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4-9 Personal computer 1 unit

4-10 Software 1 unit

5． Specifications

5-1 Method：Non-contact measurement by Corona charge (Patent)

5-2 Sheet resistance measurement range： 10^{9}～10^{15}Ω/sq

5-3 Measurement repeatability：(10 times repeat measurement)

Measurement range (Ω/sq)	Measurement repeatability (CV %)
10^{9}～10^{10}	≦10
10^{10}～10^{11}	≦5
10^{11}～10^{12}	≦5
10^{12}～10^{13}	≦10
10^{13}～10^{14}	≦15
10^{14}～10^{15}	≦20

5-4 Measurement time：

Measurement range (Ω/sq)	Measurement time (sec)
10^{9}～10^{10}	≦25
10^{10}～10^{11}	≦30
10^{11}～10^{12}	≦35
10^{12}～10^{13}	≦50
10^{13}～10^{14}	≦90
10^{14}～10^{15}	＝90

5-5 Measurement area and points Approx. 30mm ×40mm
100 points (or more), 1 mm resolution

5-6 Measureable sample size： Min：50mm x 90mm
Max: 360 mm x 360 mm
('or more , if necessary)
Max. Thickness: 5mm (t)

5-7 Gap between measurement head and sample: 1mm (set by manually)

5-8 Calibration： Calibration by known sample

5-9 Software

OS： Windows 7

Measurement：

Measurement condition setting：

Measurement data save：

Calibration：

Maintenance：

CSV File creation：

5-10 Outside・Dimension and weight

W: 601mm x H: 645 mm x D: 682 mm plus PC

Weight: 80 kg

See the layout for the sample up to 360 x 360 mm

6． Utility Requirements

・Power source Power voltage： AC100～240V

Power frequency： 50/60HZ

Power consumption： 300VA or less

Vacuum -86kPa (1 L/min.)

＊There shall be no rapid voltage change, pulse noise and high frequency noise.

・Ground Grounded resistance 10Ω or less

7. Environment

This machine conducts the ultra-high resistance measurement, so it is affected by humidity seriously.

To conduct the ultra-high resistance measurement, it needs to keep the humidity 45％RH or less. Be careful that if this system is used or kept in a place with high temperature, high humidity, vibration, corrosive gas, etc., the life of this system and probe is shortened. And, use in a place like high-power magnetic field and electric field or rapid ambient temperature changing has a badly influence for measurement.

8. Guarantees

Napson repair at no charge any failures within 1 year from the installing (for domestic, from the shipment) using under the conditions specified herein. However, for the following cases or the consumption parts, we repair at your expense.

- The failure and damage by the improper way.
- The failure and damage by the improperly altered by anyone other than Maker.
- The failure and damage by natural disasters.
- The failure and damage by using or keeping in a place with high temperature, humidity, vibration and corrosive gas etc.
- The failure and damage by static electricity.
- Consumption parts as probe head