Bridge Technology

Representing

ECOPIA

# HMS-5000, HMS-5300, & HMS-5500

## Van der Pauw

# Hall Effect Measurement System

**Temperature dependent measurement within the following ranges:**

**HMS-5000: 80°K to 350°K**
**(NOT upgradable to add high-temp kit)**

**HMS-5300: 80°K to 350°K and/or Ambient to 573°K**

**HMS-5500: 80°K to 350°K and/or Ambient to 773°K**

**(HMS-5300 & HMS-5500 are upgradeable to add either high temp or low temp sample kit)**

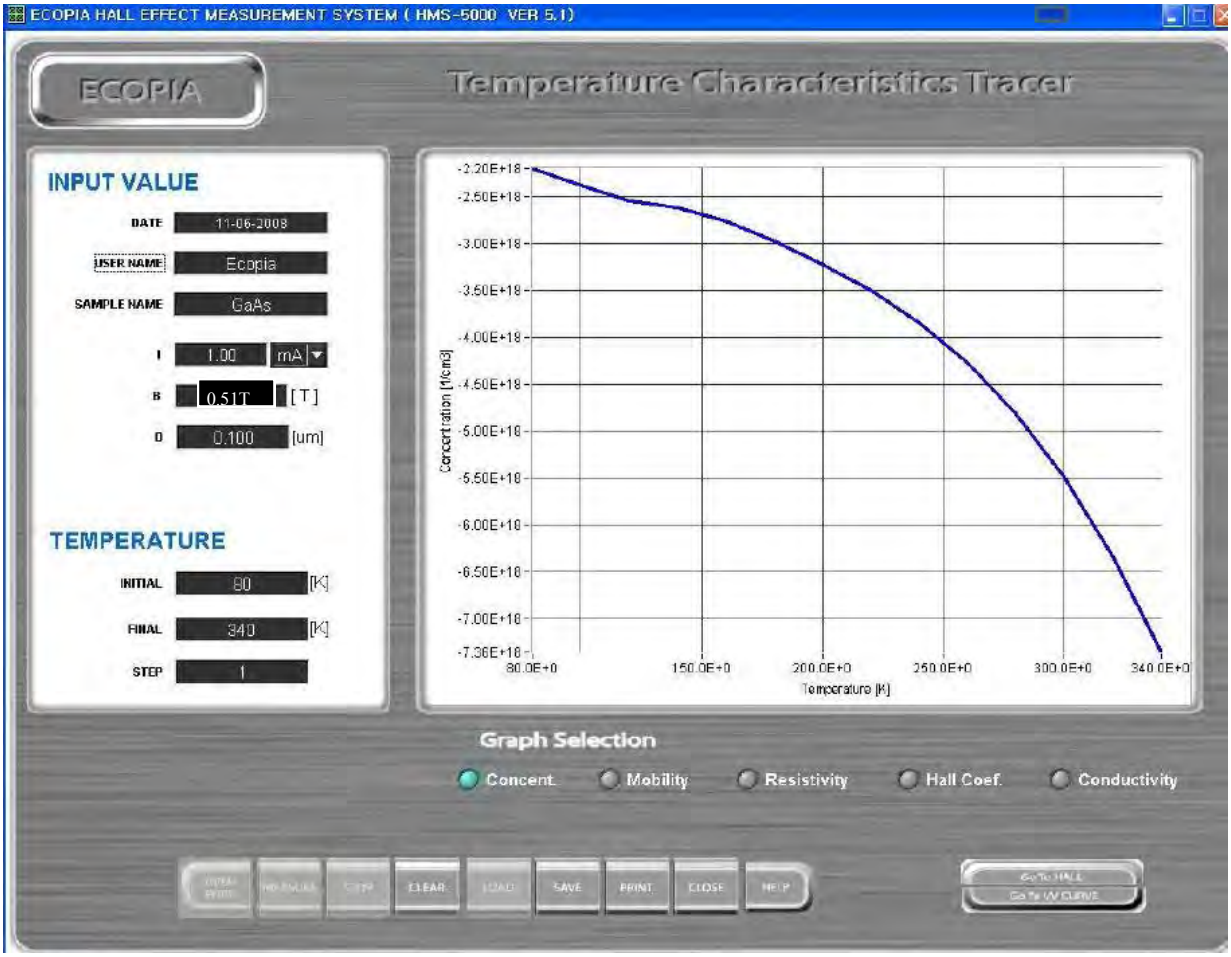

PC not included. Runs on MS Windows operating systems.

**See page 7 for Photonic Hall Effect System**

**The HMS-5000, HMS-5300, and HMS-5500 Hall Effect Measurement Systems plot concentration versus temperature, mobility versus temperature, resistivity versus temperature, conductivity versus temperature, and Hall coefficient versus temperature. The systems provides the test results as tabular data as well as in graph form. The user defines the desired temperature steps within the temperature range, fills the two LN2 reservoirs if performing sub ambient testing, and then the system automatically applies and switches the input current, measures the voltages, changes temperature, and moves the magnets all without user intervention. Once the test is finished, the temperature dependent graphs and tabular data are ready for viewing. The magnet movement is motor controlled and automated, variable temperature capability, and powerful analysis software. The systems ramp to each user defined temperature, stabilize, makes the measurement (including moving the magnet automatically), and then plots the various temperature dependent material electrical properties.**

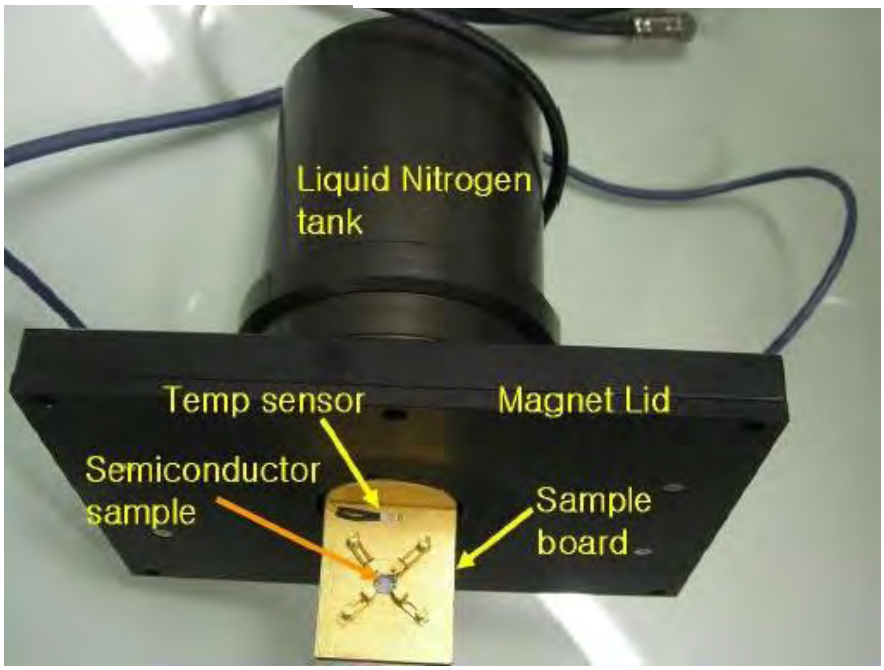
- **Sample size: 5 mm x 5mm up to 15m x 15mm**
- **Resistivity: $10^{-4}$ to $10^{7}$ (Ohms-cm)**
- **Magnet : Permanent magnet, 30 mm diameter**
- **Magnet Flux Density: 0.51T nominal +/-1% of marked value**
- **Mobility: ($cm^2$/Volt-sec) 1 ~ $10^{7}$**
- **Concentration: ($cm^{-3}$): $10^{7}$ ~ $10^{21}$**
- **Current Source: Range: 1nA-20mA Compliance: 12V**
- **Minimum Hall Voltage: 1µV**

**Temperature Ranges: HMS-5000: 80K to 350K (only)**
**HMS-5300: 80°K to 350°K and/or ambient to 573°K**
**HMS-5500: 80°K to 350°K and/or ambient to 773°K**

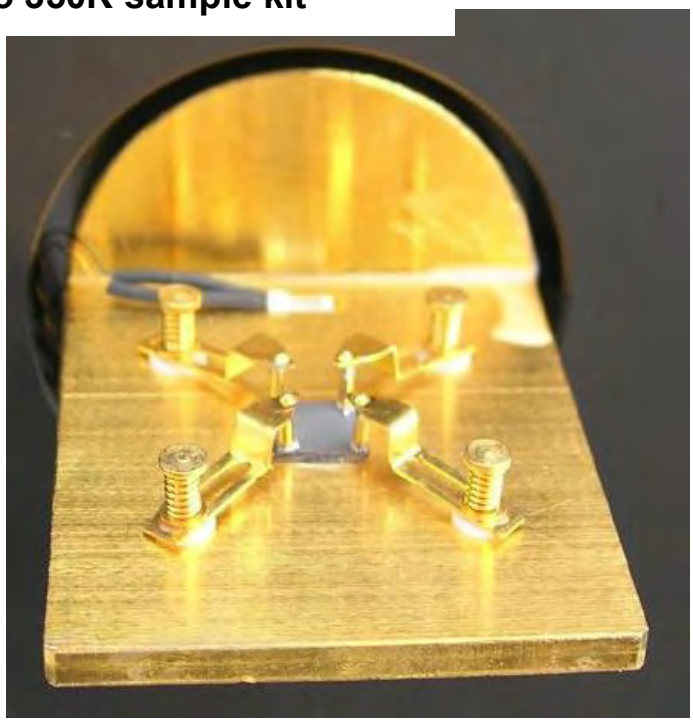



**Software displaying carrier concentration versus temperature in range from 80K to 340K**

**Shown are parts for the 80K to 350K sample kit**




**Sample Mounting Fixture with upper cooling reservoir**



**Sample Mounting Fixture**

**For best results, samples should be square in shape and can be from 5mm x 5mm up to 15mm x 15mm in size.**


**HMS-5000's Main Test Page**

**I-V, I-R graph per temp variation**

**Carrier concentration vs temp variation**

**Carrier mobility vs temp variation**

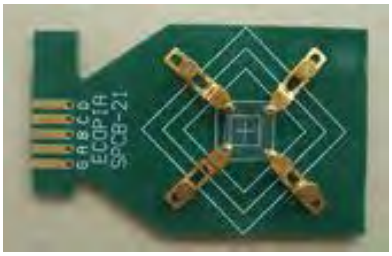
**Resistivity vs temp variation**

**Hall Coefficient vs temp variation**

**Conductivity vs temp variation**

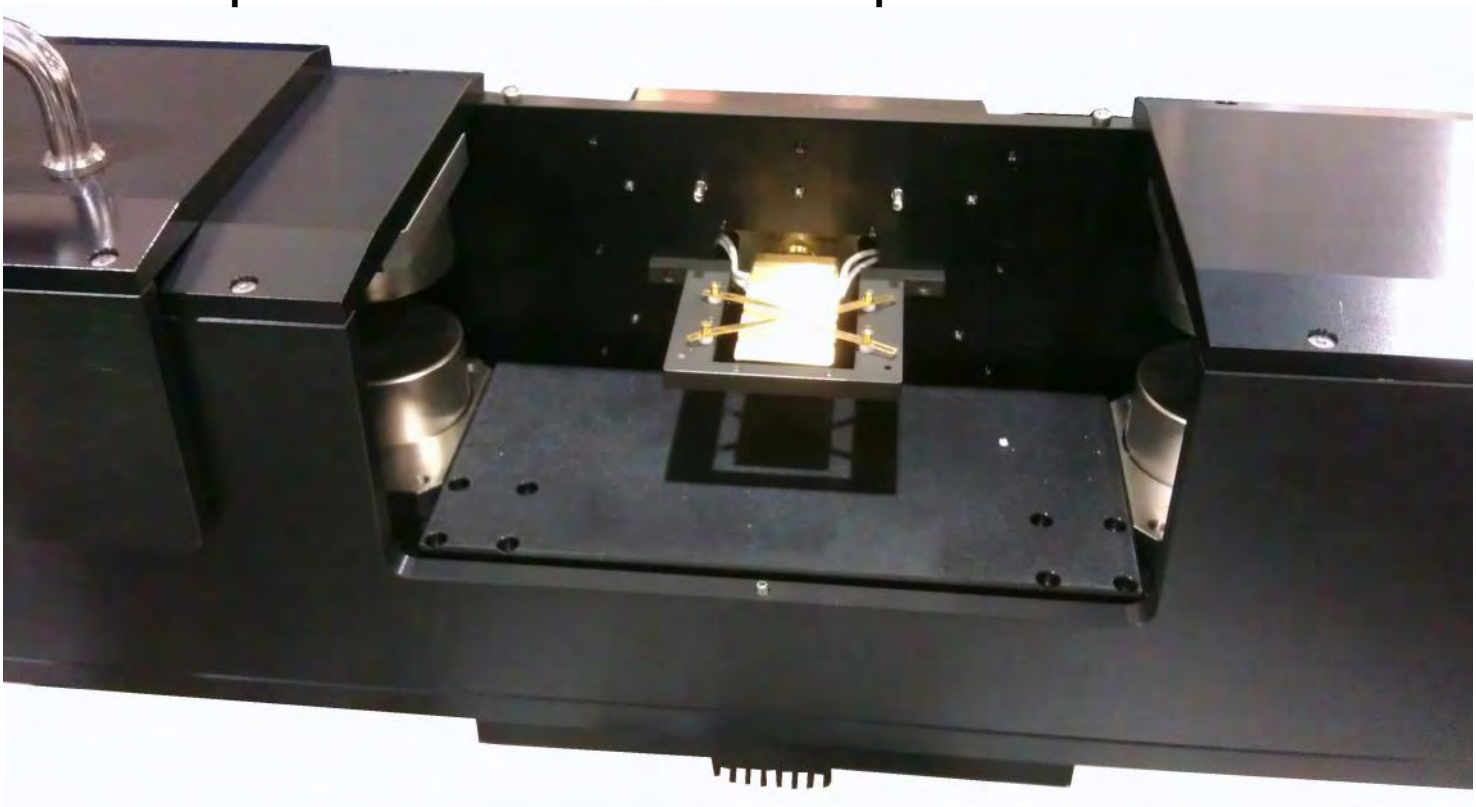
**The RTSK-5000 is an optional room-temperature / $LN_2$ temperature sample kit lid with sample board which is available as an option for the HMS-5000**

**SPCB-21 spring mount board for use with HMS-5000 when equipped with the optional room-temperature / $LN_2$ temperature sample kit. For samples up to 20mm square.**

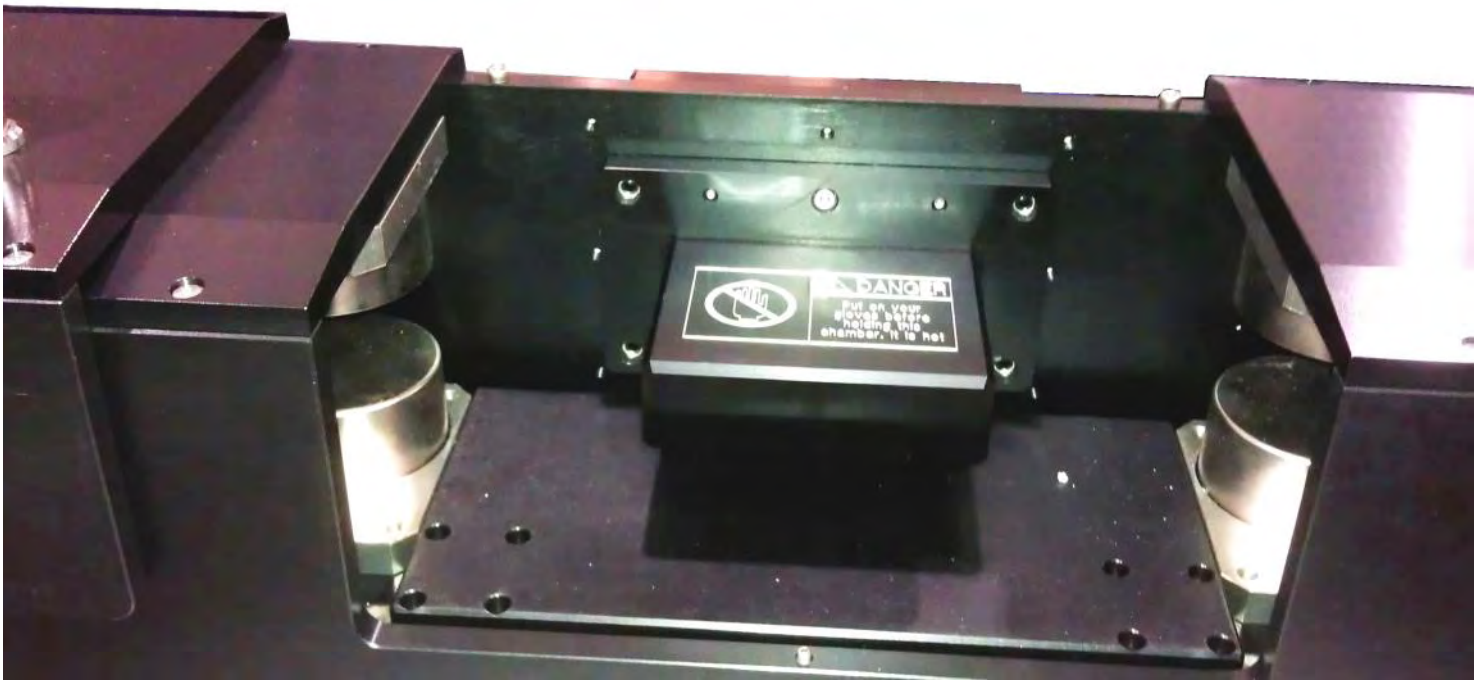



The RTSK5000 Sample Kit can be used with the low temperature versions of the HMS-5000 Series Hall Effect Measurement Systems to allow larger samples to be measured at either room temperature or LN2 temperature only. Using the RTSK reduces wear on the low temperature sample kit when only making measurements at ambient or LN2 temperature. The sample holder/lid replaces the upper LN2 reservoir. The lower reservoir can be filled with LN2 for measurement at 77K. Variable temperature capability is not available when using the RTSK sample kit.

# Room Temperature to 573°K or to 773°K Sample Kit for use with HMS-5300

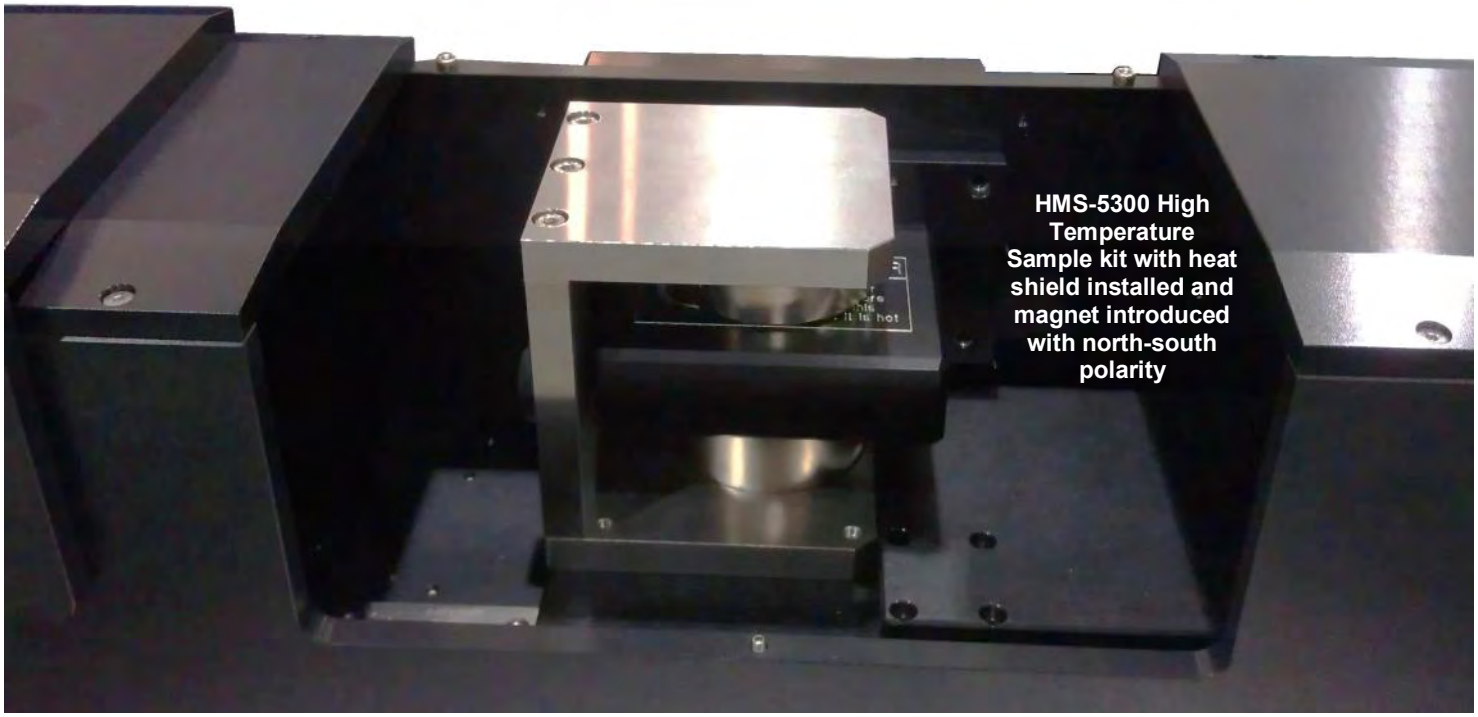


**The HMS-5000 and HMS-5300 have two 0.51T magnet sets mounted on a ball bearing slide. A 0.51T magnet set is introduced by motor control from one direction, then with reversed polarity from the opposite direction. Shown above is the high temperature sample kit which is for use with the HMS-5300 only. The sample mounts horizontally onto the heater. Spring loaded probes make contact at four corners of the sample. The 80°K to 350°K sample kit mounts the sample vertically so that it can be submerged in liquid nitrogen.**

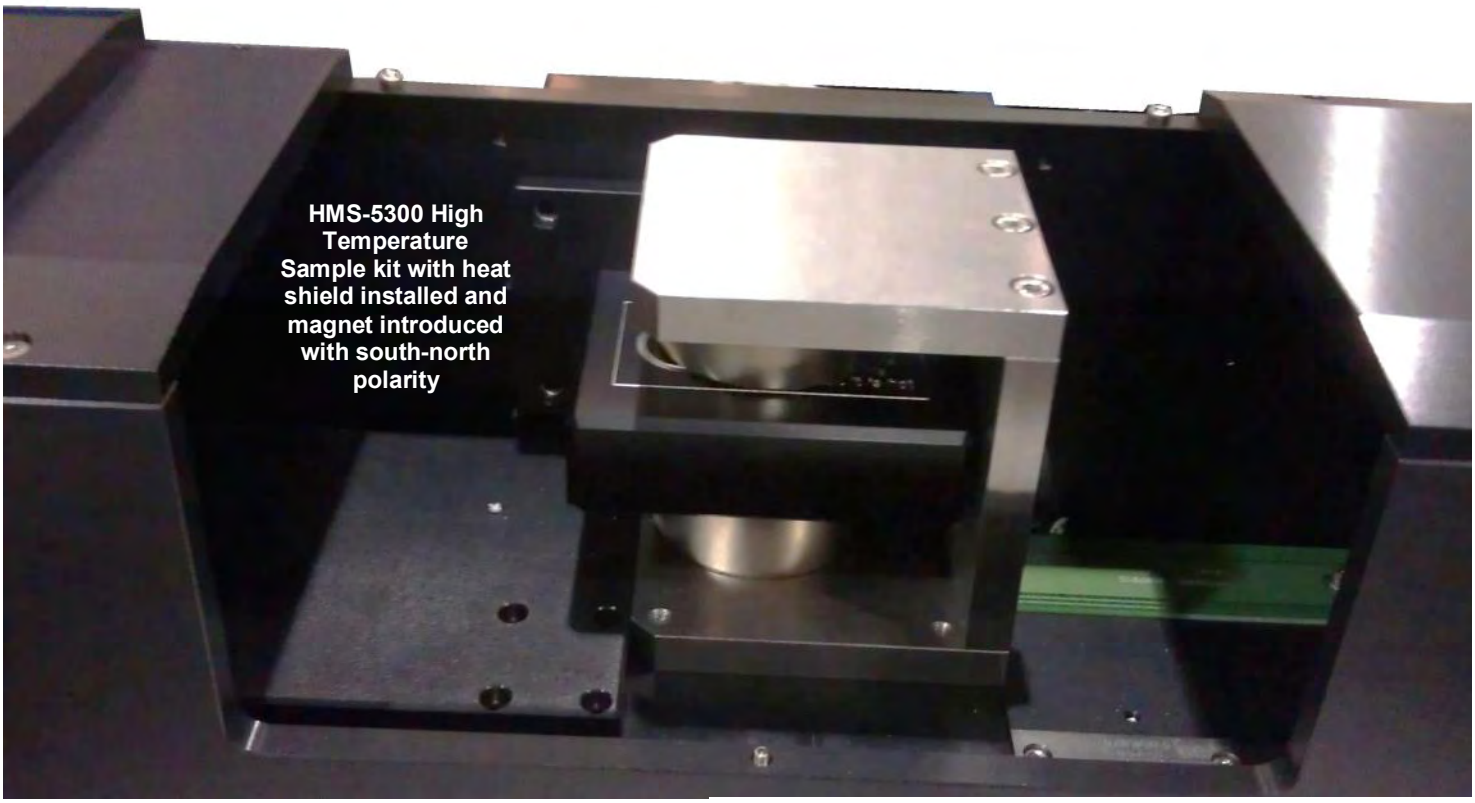



**The heat shield is placed over the sample/heater assembly when measuring at high temperatures up to 573°K (300°C) or up to 773°K (500°C). Gas ports on the back of the sample kit allow purge gas to flow during high temperature testing to prevent oxidation of the sample holder.**

**Sample kit with ambient to 573°K (HMS-5300) or ambient to 773°K (HMS-5500). Heat shield allows inert gas to be introduced to prevent oxidation of sample holder/heater. Two magnet sets on motorized ball bearing slide, shown below with left side magnet set applied.**



**HMS-5300 High Temperature Sample kit with heat shield installed and magnet introduced with north-south polarity**



**HMS-5300 High Temperature Sample kit with heat shield installed and magnet introduced with south-north polarity**

**For further information, please contact:**

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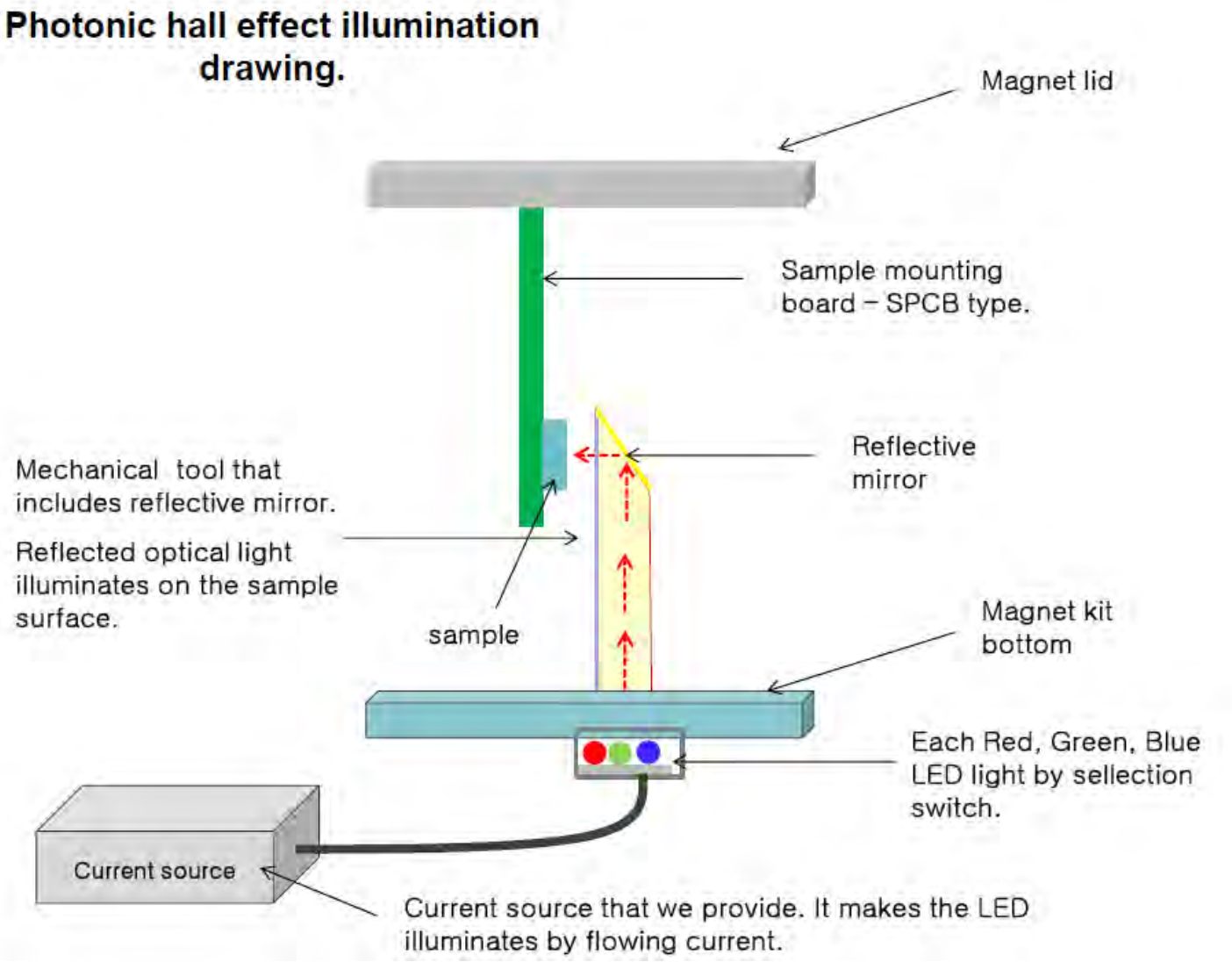
# Ecopia HMS-7000 Photonic Hall Effect Measurement

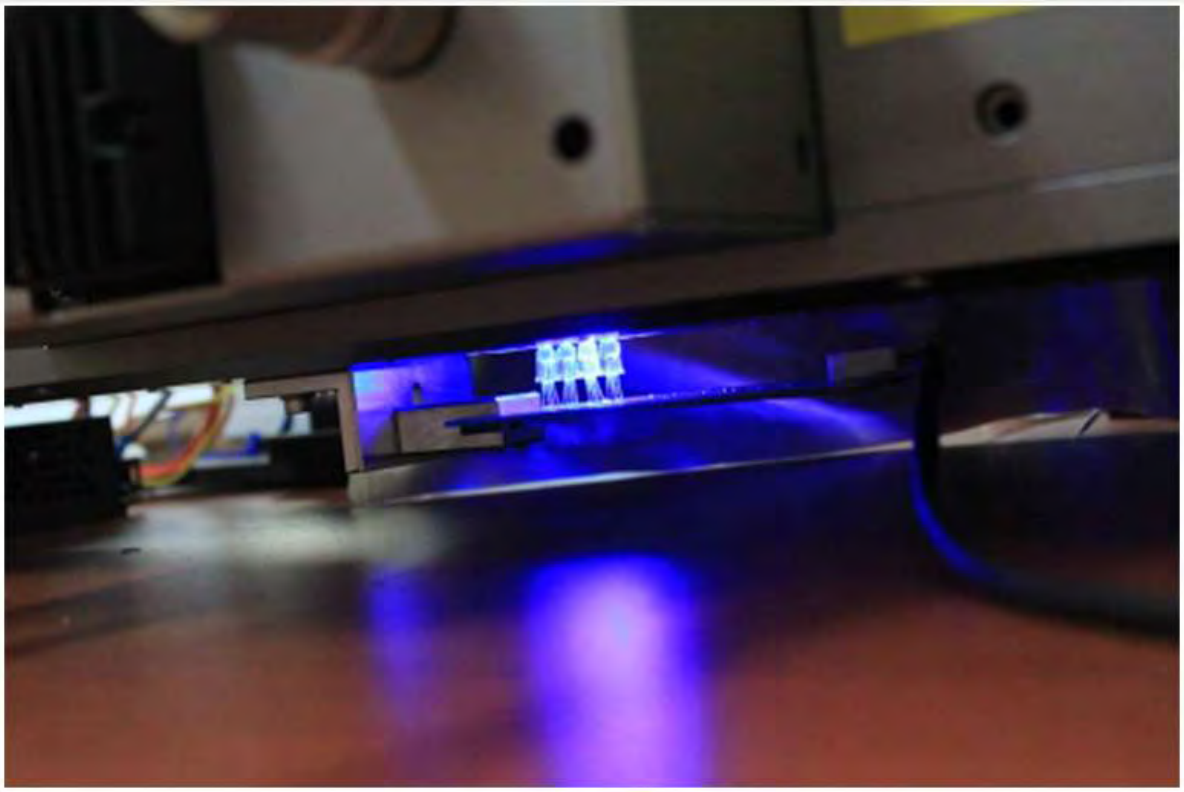
The Ecopia HMS-7000 is provided with three different LED lamps: red, green, and blue which are all visible lights. A current source is provided that flows the current which is necessary to illuminate each R,G,B lamp individually, but not simultaneously. The HMS-7000 operates automatically, however, the light for the R,G,B LED lamp's illumination is operated manually. For example, when illuminating the red color LED lamp, you select the "red" switch in the lamp module. Then you flow the current from the current source. During this you can measure Hall effect. This allows comparison of data from before and after illuminating the red color LED light.

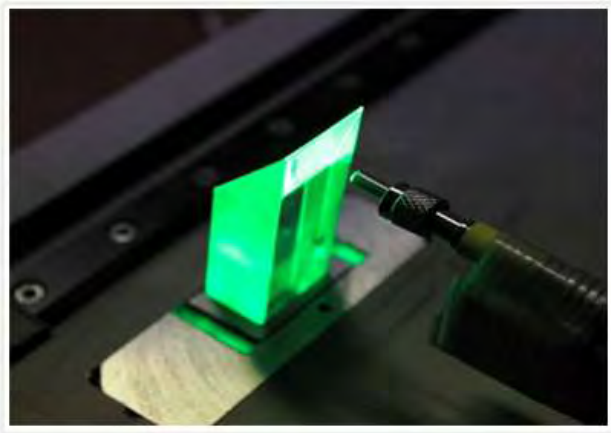
Before the HMS-7000 photonic module is shipped, Ecopia goes through the test process of flowing input current from 1mA to 100mA and then measure the light intensity at each input current. That data is provided. The customer can use this data to see current versus light intensity. The instrument and light module are not able to accurately control wavelength. It was designed to help the customer find some change in values before and after illuminating R,G,B light.

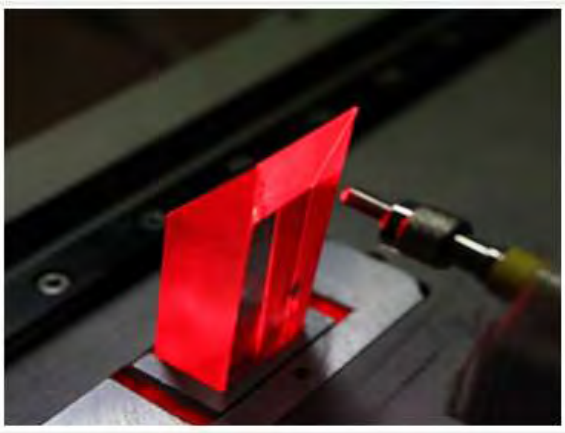
If the customer wants to control wavelength, they can buy an optical power source and integrate it with the HMS-7000.

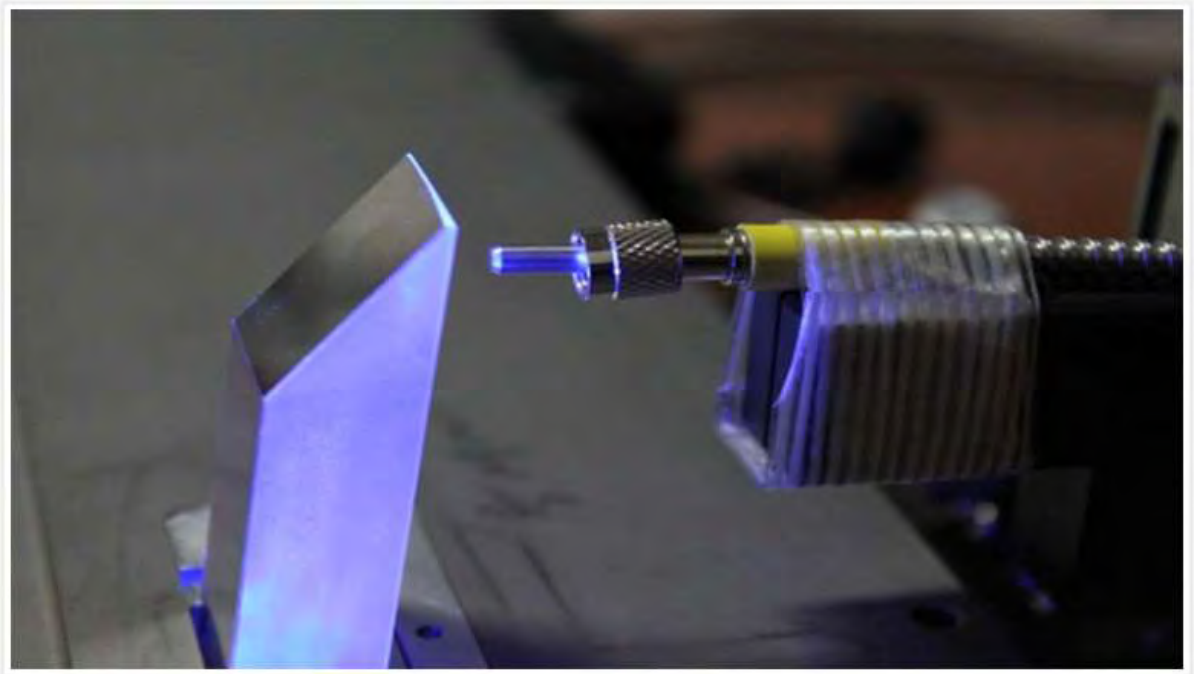


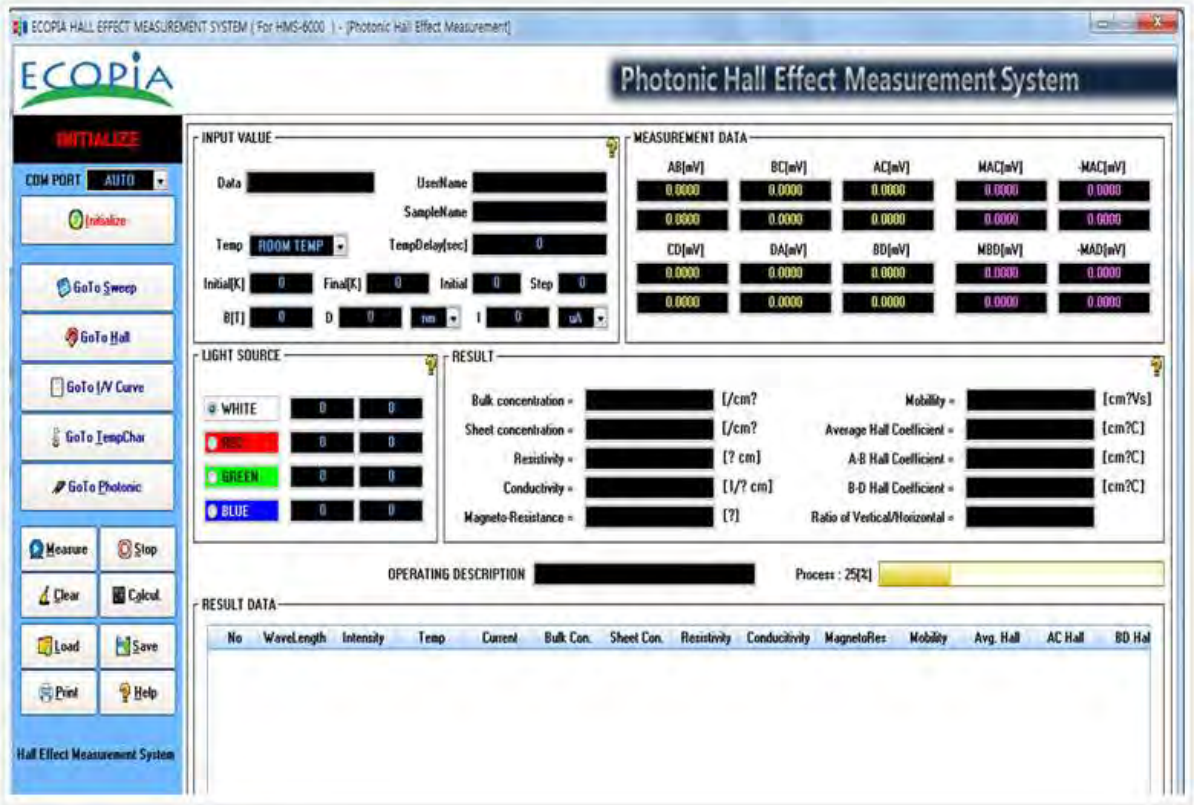
# HMS-7000 Photonic Hall Effect Measurement System







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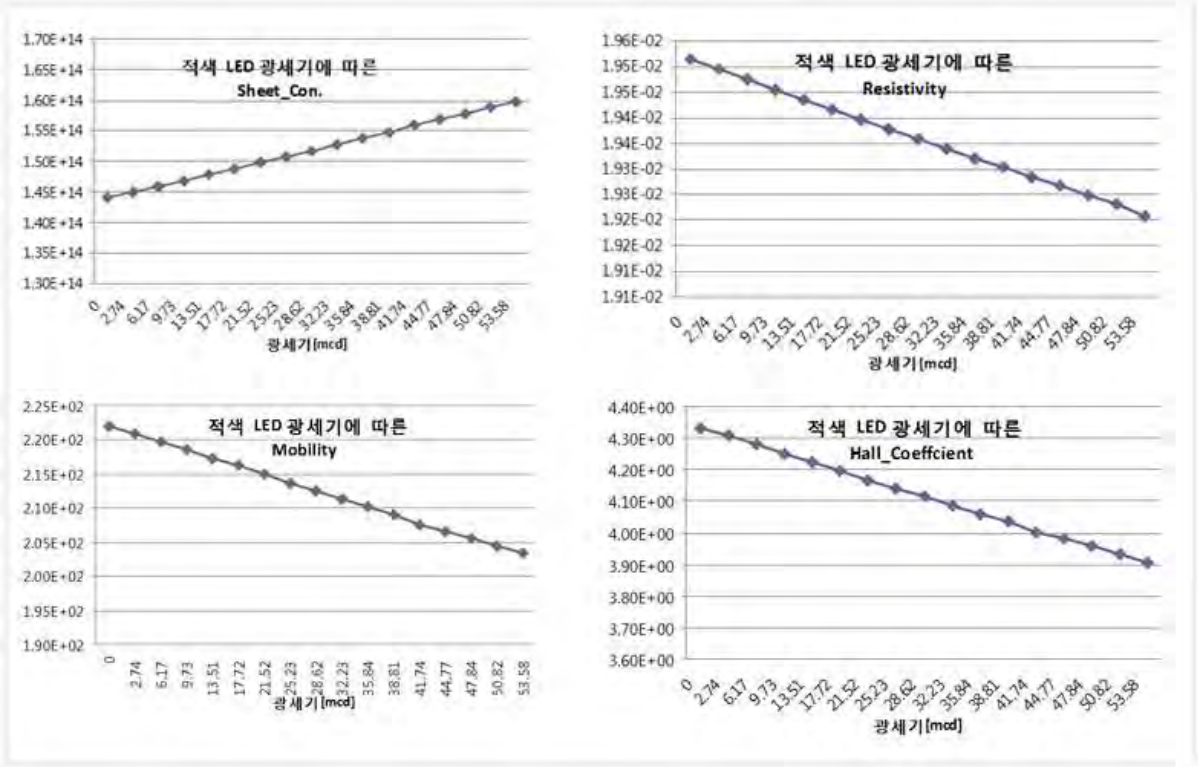
**3) Light intensity vs**




**4) Common Speicifications**

1) General Factors

| Input Current | Resistivity (Ω·cm) | Concentration ($1/cm^3$) | Mobility (cm2/Volt·sec) | Magnetic Flux Density(T) | Temperature (K) | Measurable Sample size |
|---|---|---|---|---|---|---|
| 1nA - 20mA | $10^{-4}$~$10^{-7}$ | $10^{7}$~$10^{21}$ | 1~$10^{7}$ | 0.51Tesla (± 0.03T) | **RT(상온)** | 5×5mm ~ 20×20mm size. Less than 2mm thickness |

2) Sample Structure 3D of Measurement Sample

3) S/W Operation Environment Windows 98 / ME / 2000 / NT / XP / VISTA/ Win7

4) Data Index
- Bulk, Sheet Carrier Concentration
- Resistivity
- Carrier mobility, Hall Coefficient
- Magneto-resistance
- Alpha (Vertical/Horizontal ration of resistance)

5) Dimension

* Size :

- main body 440 x 420×140 mm (W×H×D) / Weight : 8.5 kg
- magnet kit 700×220×280 mm (W×H×D) / Weight : 15.5 kg

6) Materials for Measurement

Solar cell,

Si, SiGe, SiC, GaAs, InGaAs, InP, GaN, TCO(including ITO), AlZnO, FeCdTe, ZnO, etc., all of semiconductors can be measured (N/P-type)