Toho TECHNOLOGY

HL9900

HALL EFFECT
Measurement

The Toho Technology HL9900 is a turn-key, high performance Hall System for the measurement of resistivity (ρ), carrier concentration (N), and mobility (x) in semiconductors. Modular in concept, allowing easy upgrade paths, the system is suitable for a wide variety of materials, including silicon, compound semiconductors and metal oxide films.

Configurations

Measurement Head

The HL9900 configuration is suitable for sheet resistivities from 0.1 mΩ/square to in excess of 1 MΩ/square. The measurement head is supplied with a two-temperature measurement stage complete with removable dewar and four micromanipulator probes.

Buffer Amplifier

The HL9980 high impedance buffer amplifier/current source is available, extending sheet resistivity measurement capability to 100 GΩ/square and source currents to as low as 1 pA. Close proximity of the module to the sample, along with the use of driven guards, ensures minimization of cable capacitance effects. A special shielded sample holder is supplied (room temperature operation only).

Magnet

Type	Permanent with field reversal by magnet rotation
Field	Strength ±1% of marked value
	Stability 0.1% over 10 years
	Uniformity ±1% over 25 mm diameter from center
Pole Gap	33.4 mm
Max Meas. Diameter	25 mm
Field Strengths	0.5 T (Alternative Strengths Available)

Features

AC/DC measurement modes. The use of AC currents and phase sensitive detection eliminates thermal effects, long term drifts and significantly enhances signal-to-noise ratios. DC mode is useful when rate dependent trapping, rectification due to non-ohmic contacts[2] or stray capacitances may affect AC currents.

- Simple probe system for convenient, fast sample throughput
- Compact bench top design
- Wide current range including auto-current facility in order to minimize sample heating
- User defined electric field limitations to avoid impact ionization effects at low temps
- Rare earth permanent magnet giving excellent stability
- Light-tight sample enclosure avoiding measurement errors due to photo generated effects
- Electro-forming circuitry for contact formation

Configurable Features

- High impedance buffer amplifier/current source to extend sheet resistivity measurements to 10^{11} Ω/square
- Probe system allowing rapid sample set-up for room temperature and 77 K assessment of wafers up to 3-inch diameter[1]

Toho Technology Inc.
4809 N. Ravenswood Ave. Suite 113
Chicago, Illinois 60640
773.583.7183
www.tohotechnology.com

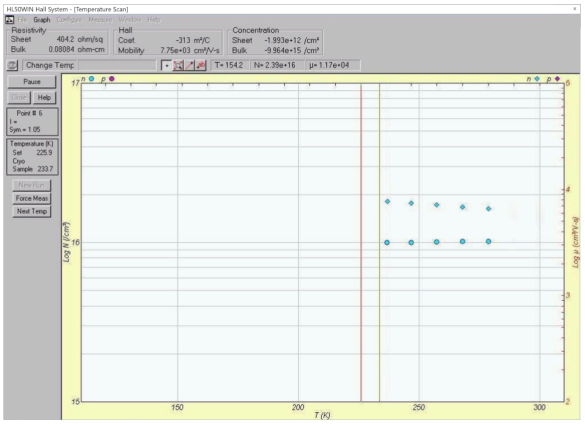
Toho TECHNOLOGY

HL9900

HALL EFFECT
Measurement

Software

- Support for Van der Pauw, Hall Bar and Bridge Samples
- Integration, delay & repeat measurement modes increases flexibility and accuracy on difficult to measure samples
- Easy export and storage of data for incorporation in other Windows applications.
- Contact verification including I-V curve tracker
- Electro-forming process for the formation of ohmic contacts
- Correction algorithms for surface and interfacial depletion effects
- Correction for Hall Scattering Factor
- Control of all measurement functions, data reductions



Sample Temperature Scan running in the HL50WIN GUI

Specifications

Current Source	**HL9900**	**HL9980**
Current Range	100 nA - 19.9 mA	1 pA - 10 μA
Compliance	20 V	20 V
Output Impedance	10^{10} Ω	>10^{13} Ω
Voltage Measurement		
Input Impedance	10^{10} Ω	10^{15} Ω in parallel with 3 pF input
Input Voltage Operating Range	±6 V	±6 V
Input Leakage Current	20 nA per input (typical)	40 fA per input (typical)
Current Input Voltage Leak	0.8 μV pk-pk at 0.1 - 10 Hz (typical) 15 nV/√Hz at 213 Hz	4.0 μV pk-pk at 0.1 - 10 Hz (typical)
Measurement Modes	AC (213 Hz)/DC	DC
Sample Inputs	Coaxial	Two-lug female coaxial BNC with driven screen Guard to input potential <100 μV
Contact Switching	FET	Dry Reed

Dimensions (not including CPU)

Measurement Head	535mm (W) x 700mm (D) x 295mm (H)
Instrumentation Unit	280mm (W) x 400mm (D) x 150mm (H)

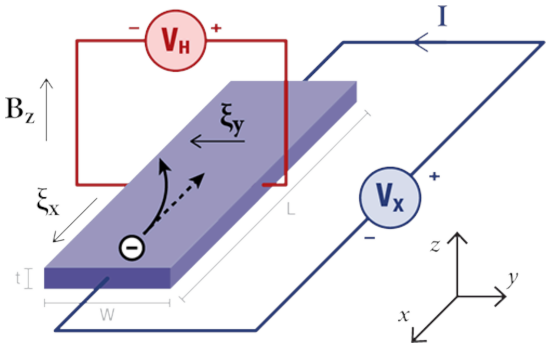
Weight

Measurement Head	47.8 kg
Instrumentation Unit	9.0 kg

Options

HL9900/M50	0.5 T Magnet (nominal)
HL9901	Spare Two-Temperature Stage
HL9902	2-inch Teflon Sample Dewar
HL9903	3-inch Teflon Sample Dewar
HL9904	Calibration Set
HL9906	6-inch Teflon Sample Dewar
HL9910	Additional Two Probes
HL9980	High Impedance Buffer Amplifier / Current Source

All systems supplied with current version of Windows.



Hall Effect Diagram

1 Using optional HL9903.

2 Not available when HL9980 is fitted.

Industry Standard
Original Nanometrics core technology inside