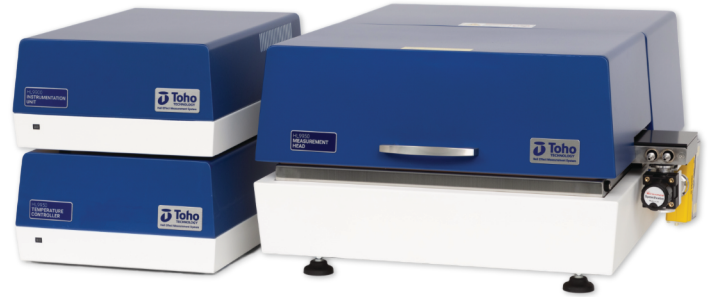




HL9900

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 (μ) 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. The HL9900 has both low and high resistivity measurement capabilities, with dual temperature capability and an optional cryostat extending the temperature range from below 90K to 500K



Configurations

Measurement Head

The HL9900 configuration is suitable for sheet resistivities from 0.1 m Ω /square to in excess of 1 M Ω /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 G Ω /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).

Cryostat

The HL9950 cryostat uses a horizontal, continuous flow, liquid nitrogen design. It is normally evacuated in order to remove moisture, which may affect measurements. The cryostat fits neatly between the pole-pieces of the magnet and has a viewing window through which the HL9920 stereo microscope option can be employed for easy probe location. It is designed to be fully compatible with the HL9980 high impedance buffer amplifier/current source which, when fitted, is switched into the measurement circuit automatically if the sample current falls below 0.1 μ A.

Magnet

Type	Permanent with field reversal by magnet rotation
Field	Strength \pm 5% of marked value
	Stability 0.1% over 10 years
	Uniformity \pm 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 contacts² 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

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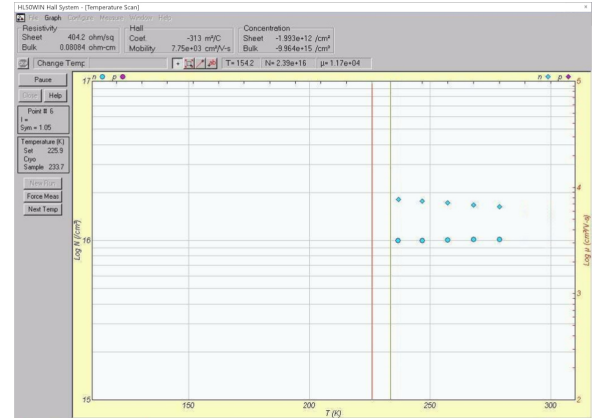


HL9900

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 with plot tracking
- 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 ¹³ 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)
HL9902	Spare Teflon Sample Dewar
HL9903	3-inch Teflon Sample Dewar
HL9904	Calibration Set
HL9910	Additional Two Probes
HL9920	Stereo Microscope
HL9950	Liquid Nitrogen Cryostat Stage (90K - 500K)
HL9980	High Impedance Buffer Amplifier / Current Source

All systems supplied with current version of Windows.

HL9950 Cryostat

Temperature

Range	90K - 500K
Accuracy	± 0.5K
Stability	± 0.1K

Cool-down Time

5 minutes

Max Sample Size

15 x 15 mm

¹ Using optional HL9903.

² Not available when HL9980 is fitted.