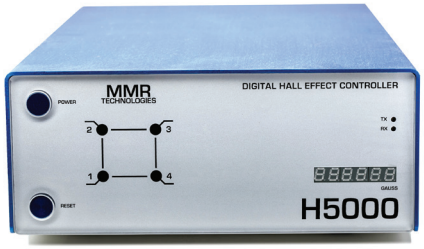
MMR TECHNOLOGIES

The World's Resource for
Variable Temperature
Solid State Characterization

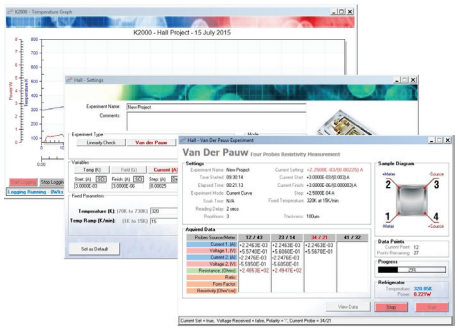
ACHIEVE YOUR GOALS IN MATERIALS RESEARCH AND DEVELOPMENT

Hall Effect and Resistivity Measurements with New MMR H5000 Controller

H5000 Hall Effect and van der Pauw Controller



MMR Software Suite



Hall Effect System Specs

Resistivity Range (Ω*cm):	10^{-4} - 10^{13}
Mobility Range (cm^2/Vs):	1 - 10^7
Carrier Density Range (cm^{-3}):	10^3 - 10^{19}
Temperature Range (K):	70 - 730
Temperature Accuracy (K):	0.1
Temperature Stability (K):	0.1
Current Source Range (A):	10^{-12} - 10^{-2}
Voltage Measurement Range (V):	10^{-6} - 2.4
Magnetic Field Range (T):	± 1.4
Max Sample Size (mm):	10 × 12
Electrical Connections	triaxial

Hall effect and resistivity measurements are key techniques in R&D of new solid state materials and semiconductors in particular. At the initial stages of materials research, measurements of the majority carrier mobility, density, and type of electrical conductivity are critical. Indeed, measurements of mobility as a function of temperature are very informative, which provide an understanding of scattering mechanisms governing electron/hole transport in the material bulk. Likewise, studies of carrier statistics with temperature allow one to measure activation energies of shallow impurities and explore energy structure in the band gap of a semiconductor. These are only a couple of examples which underline the importance of this technique. In a real laboratory environment, a high performance automated Hall Effect system can become an expensive tool. Before considering buying an electromagnet and an expensive bipolar power supply, one must account for the expenses of a DC current source/meter, sensitive voltmeter, switching card, and signal amplifiers as well as the gaussmeter. Although a number of vendors offer an unprecedented quality of electronics, the final price for the Hall effect system can easily exceed the research budget. MMR Technologies designed the H5000 Hall effect and van der Pauw controller by keeping in mind both, the measurement performance and your budget. All-in-one, this controller combines the current source/meter, voltage source/meter, programmable switching relays, amplifiers, the gaussmeter, and magnet feedback circuitry via control of the bipolar power supply. Together with a well developed MMR Software Suite, this controller enables researchers to make Hall Effect and resistivity measurements with a high degree of accuracy and flexibility. Using the H5000, one can measure current-voltage curves, resistivity by four probes van der Pauw technique, the Hall Effect, and magnetoresistance. The H5000 controller and software support an operation of both electromagnets and permanent magnets. It is capable of bias/measurements for wide range currents (1 pA – 10 mA) and voltages (1 μV - 2.4 V). The use of well designed cryostats and triaxial cables for signal acquisition enables low electrical noise operation and high measurement accuracy. In combination with the new MMR K2000 digital temperature controller and MMR patented Joule-Thomson refrigerator, one can characterize samples across a wide temperature range of 70 K - 730 K and receive scientific results ready for publication.

Contact MMR Technologies for additional details

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