# *Faster* Hall analysis in a Quantum Design PPMS®

# MeasureLINK™ M91 FastHall™ controller

**The Lake Shore Cryotronics M91** instrument delivers significantly higher levels of precision, speed, and convenience as compared to traditional Hall effect measurement solutions. Combining all the necessary Hall measurement functions into a single instrument, the M91 automatically executes measurements and calculates the final Hall and mobility parameters. The instrument eliminates manual trial-and-error steps and ensures that measurements are always made under optimal conditions for the sample.

The instrument also provides better measurements faster, especially when characterizing low-mobility materials. Most commonly measured materials can be analyzed in a few seconds. This is because the instrument's patented FastHall technology eliminates the need to reverse the magnetic field during the measurement. This is particularly beneficial when using the M91 with the superconducting magnet of a PPMS, allowing for much faster analysis of low-mobility material samples in van der Pauw (vdP) wired geometries.

## *Key features*

- No need for field reversal during the measurement due to the FastHall technology
- Automatically selects optimal excitation and measurement levels, checks sample contact quality, executes measurement steps with standard protocols, and provides complete Hall analysis
- Calculates derived parameters for vdP and Hall bar samples
- FastHall technology extends mobility range down to 0.001 $cm^2/(V{\cdot}s)$ when measuring vdP samples
- Touchscreen UI displays measurement process steps as they execute in real time


*The M91 automatically checks and graphically displays sample contact quality*


## Electrical measurement specifications

The M91 FastHall Measurement Controller integrates all the required source measure, and signal switching capabilities for these system measurement specifications:

### Resistance (R)

Range: 10 mΩ to 10 MΩ source current

Monitor temperature and change setpoints with the monitor pane

### Mobility (μ)

Mobility Range: $10^6$ $cm^2/(V{\cdot}s)$ to 0.001 $cm^2/(V{\cdot}s)$

### Source parameters

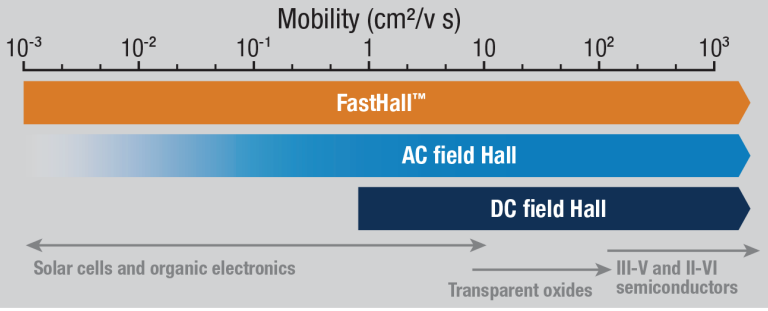
Current Source Range: 1 μA to 100 mA (lowest usable current: 10 nA)

Current Measurement Range: 100 mA to 10 nA

Compliance Voltage: 10 V, maximum

Voltage Measurement Range: 1 mV to 10 V

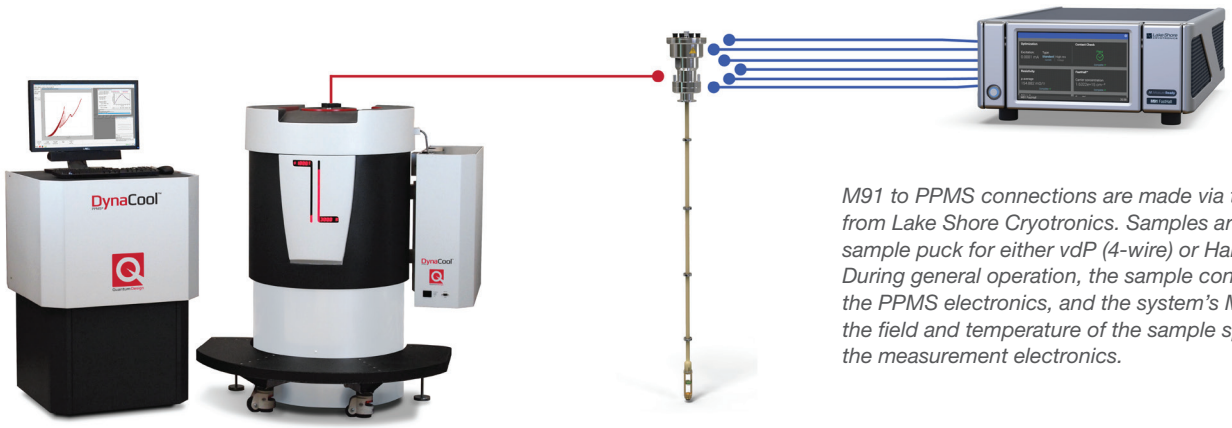
Compliance Current: 100 mA, maximum




For more information, visit **www.lakeshore.com**

Lake Shore Cryotronics, Inc. | t. 614.891.2243 | f. 614.818.1600 | info@lakeshore.com | www.lakeshore.com

## *Simple setup and integration*



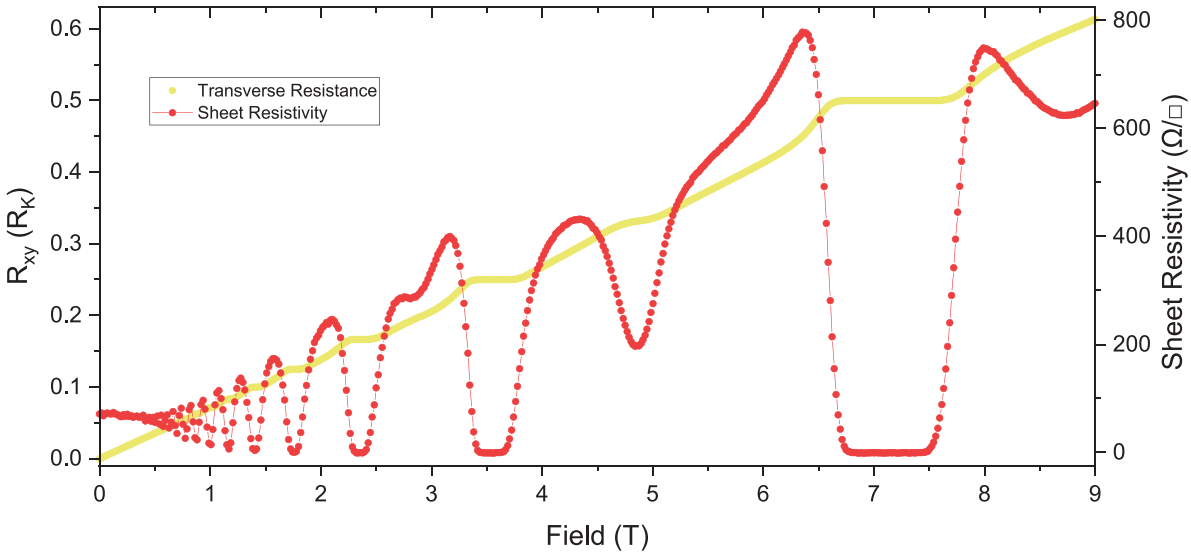

*M91 to PPMS connections are made via triaxial cables available from Lake Shore Cryotronics. Samples are wired to the PPMS sample puck for either vdP (4-wire) or Hall bar (6-wire) geometries. During general operation, the sample connector is connected to the PPMS electronics, and the system's MultiVu™ software controls the field and temperature of the sample space while coordinating the measurement electronics.*

# Electrical measurement specifications

The M91's MeasureLINK™ software for Hall measurement control integrates easily with the PPMS MultiVu application software. MeasureLINK can be installed on the same PC with the MultiVu software or on a separate PC that is on the same network as the MultiVu PC.

### Once installed, MeasureLINK:

- Provides a simple way to start and step through your measurement sequences, as well as chart, log, and organize the results
- Includes scripts for running Hall measurements and reporting the results
- Enables automated control of field and management of sample temperature
- Generates detailed reports including all the supporting intermediate data so you can readily confirm the integrity of the final results
- Allows for customization of measurement sequences for specific Hall research requirements (optional upgrade)




*Field-dependent transverse and longitudinal transport measurements for a GaAs 2-D electron gas system at 2 K with 1 μA sourced excitation current in the van der Pauw geometry. Plateaux in the transverse channel demonstrate the integer quantum Hall effect and correspond to where the Fermi level falls in an area of localized states between neighboring Landau levels.*

*Sample provided by Dr. M. Pendharkar, Chris Palmstrøm Group, University of California Santa Barbara.*

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