MODEL 6800A

Transportable & Affordable QHR Standard

- Accuracy to < 0.02 PPM
- Features Accubridge Technology
- Built in Vxx (uVolt) Measurements for Sweep Check, Contact Resistance Measurements
- Built in Vxy (nVolt) Measurements for Dissipation Measurements
- QHR Samples Produced and Certified By NMI
- Direct Transfer to 1 and 10kΩ Std.
- System Range 0.1Ω to 100kΩ
- Power Failure Battery Backup Detection
- Built in Safety Shutdown Feature
- Fully automated build up or build down from QHR Value
- Manual or IEEE488 Controlled
- 8T or 9T Magnet Requires Less Liquid Helium Consumption
- Room Temperature DCC Requires no Liquid Helium to Operate
- Built in Persistent Mode for Lower Liquid Helium Use
- Sample Interchange Design
- System, Bridge, Samples Calibrated/Verified by NMI

MODEL INFORMATION

The Quantized Hall Resistance Standard is internationally recognized as the representation of the ohm and is the most stable resistance standard known. Many National Laboratories and industries are finding a need to provide highly accurate, traceable reference standards in support of their “hi-tech” environments. The 6800A system has been developed to meet the needs of National Laboratories and Primary Industrial Laboratories around the world.

In the International System of units, the ohm is derived from the volt and the ampere. In practice, quantised Hall resistors have been used in national laboratories to represent resistance since 1990. These resistors are semiconductor devices which, when cooled to 1.2 Kelvin or less in a magnetic field of several tesla, yield values of resistance which are essentially invariant, and which are believed to be multiples of fundamental constants. By international agreement, the first multiple is taken to be equivalent to 25812.807 ohms.

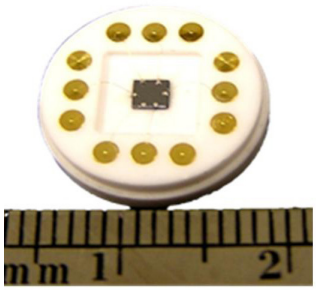
The MI 6800A (Quantized Hall Resistance Standard) is a fully automated primary standard developed as an economic means to provide a highly reproducible resistance standard. This system is a completely “turn-key” system and requires little to no manual intervention. A wide neck storage Dewar and instrumentation rack are mounted on castors for portability.

A variable temperature pumped ^{4}He refrigerator with integral 8T or optional 9T magnet can be installed Alternatively the system can be operated continuously if a supply of helium exists in the facility. The cryostat is designed to operate over a 4 to 7 day period on one fill. Typically all measurements can be performed in two days. System preparation can be completed easily within half a day and cool down the second half of the day. Within two days you can have the system cold and the complete measurement of QHR vs 1kohm as well as scaling down to 0.1Ω or up to 100kΩ!

The 6800A system provides an economical means to accurately and precisely establish and measure resistance values from 0.1 to 100K Ohms. The system is a development of many years of experience in Quantized Hall System Design, Resistance Measurements and Cryogenics.

The 6800A System is the first portable Quantized Hall Resistance Standard in the world and consists of three parts, all of which are supplied and described on the following page.

Sample: 6800A Resistance Standard provides the absolute value of resistance related to the Von Klitzing constant of 25812.807 ohms. Operating on step I = 2 the 6800A compares the QHR value of 12906.4035Ω to a 1kΩ resistor. The reference or sample, developed at the National Research Council of Canada (NRCC) is maintained at 1.2K in a mobile 55 liter Helium filled dewar, fields to 8 tesla or 9 Tesla being supplied by the integral magnet. The system is designed to operate over a period of 3 to 7 days. Special precautions have been taken to avoid contaminating or damaging the sample.



Cryogenics: The 6800A consists of a 55 liter dewar with a pumped ^{4}He refrigerator, an 8T or 9T superconducting magnet with support assembly, temperature sensor, heater and a 19" instrument rack with superconducting magnet power supply, temperature controller, helium level sensor and an oil free mechanical vacuum pump.

The Dewar is mounted on heavy-duty castors for transportability from one room to another. The system can also be shipped cold from one facility to another as a primary reference transfer standard.

Recent design improvements to the system have been implemented to allow for the addition of an easier method for Sample Interchange. By including this into the design users of the 6800A can now easily interchange samples at their convenience without exposing the sample to atmosphere until it has reached room temperature.

Measurement System: An improved Direct Current Comparator Bridge (Model **Accubridge**) operating in room temperature air which allows two resistors to be compared with accuracy's to 2 part in 10^{-8}. The Accubridge Bridge is used to compare the QHR device directly to a 1000Ω standard resistor. The bridge can also be used to measure the field dependence of Rxx and Rxy, to make precision measurements of Rxx and to measure the contact resistance of the QHR device: in short, to carry out all the measurements necessary to ensure the accuracy of the QHR resistor. The bridge and low thermal matrix scanner can then be used to build up or down from the 1000Ω resistor to establish values for 1, 10, 100, 1K, 10k and 100k Ohm primary resistors to a very high level of accuracy. The 6800A Bridge can be used stand-alone or with Measurements International's 6800A software for automated measurements.

The 6800A system is modular in design and the three parts:

1) 6800A sample

2) 6800A Cryogenics

3) 6800A Bridge

May be purchased separately.

Accessories: (Please view data sheet on web for complete specifications)

9400

Standard Resistor Oil Bath

9300A

Temperature Controlled Standard Resistor Air Bath with GPIB

9210A-1 (PRIMARY)

1Ω Resistor with Carrying Case

9331R (PRIMARY)

Series of Four Terminal Air Resistors from 1Ω to 100kΩ

9331 (SECONDARY)

Series of Four Terminal Air Resistors from 1mΩ to 100MΩ

Specification

Accuracy	2×10^{-8}
Stability	$< 1 \times 10^{-8}$
Insulation Resistance	$>10^{13}$ Ohms
Magnet Strength	8 Tesla or 9 Tesla
Plateaus	i=2
Temperature	^{4}He, 1.2K
Dewar Size	55 liter
Operating Environment	18 to 34 °C, 10 to 80% RH
Warranty	1 Year Parts & Labor

Dimensions:
122 x 49 x 46 cm (Rack)

Weight:
115 kg

Shipping Weight:
137 kg

Accessories:
4220A
QHR Sample
9400
9300A
9210A
9331R
SPSCW – XX – YY 4 Conductor, Teflon, Shielded Cable
(Where XX represents length of cable, YY represents number of cables)

Operating Power:
100, 120, 220, 240V - 50/60Hz

Disributed By:

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