



6800A Transportable & Affordable QHR Standard

*Manual or IEEE488 Controlled
V_{xx} and V_{xy} Measurements
Accuracy to 0.02 PPM
Modular "Turn-Key" System
Direct Transfer to 1 and 10K Ω Std.
Range 0.1 Ω to 13k Ω*

General Description:

The Quantized Hall Resistance Standard is internationally recognized as the representation of the ohm and is the most stable resistance standard known. Many developing countries 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.

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 ⁴He refrigerator with integral 8T or optional 9T magnet can be installed and removed easily, allowing the Dewar to be sent for filling as required. 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 5 day period on one fill. Typically all measurements can be performed in two days.

The 6800A system provides an economical means to accurately and precisely establish and measure resistance values from 0.1 to 13K 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.

Model 6800A

Sample: 6800A Resistance Standard provides the absolute value of resistance related to the Von Klitzing constant of 25812.807 ohms. The reference or sample, developed at the National Research Council of Canada (NRCC) is maintained at 1.2K in a mobile 50 liter Helium filled dewar, fields to 8T or optional 9T being supplied by the integral magnet. The system is designed to operate over a period of 3 to 4 days or it can be operated continuously. Special precautions have been taken to avoid contaminating or damaging the sample.

Cryogenics: The 6800A consists of a 50 liter dewar with a pumped ^4He refrigerator, an 8T or 9T superconducting magnet with support assembly, temperature sensor with indicator, 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.

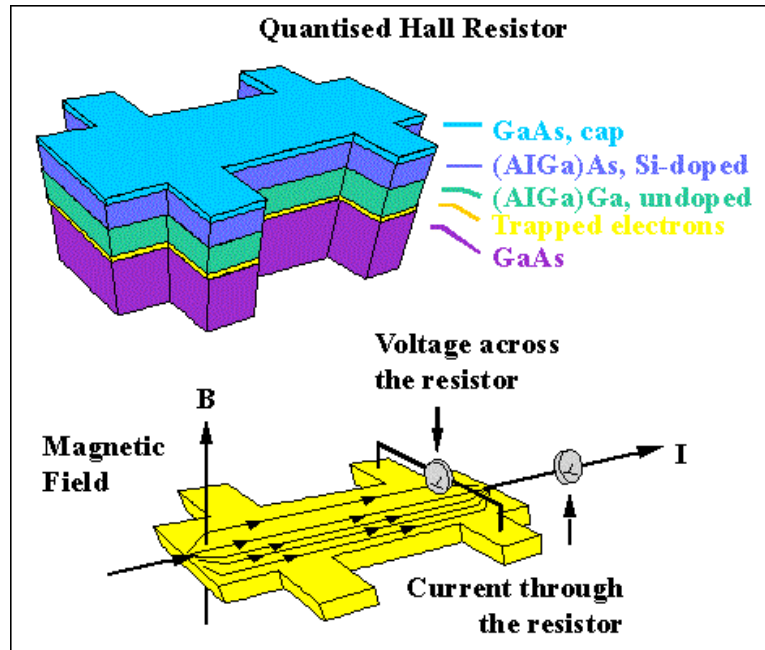
The system may also be purchased with a nine Tesla magnet, which will allow the system to be used with other samples. The support assembly can be easily removed which allows other samples to be tested.

Measurement System: An improved Direct Current Comparator Bridge (Accubridge) operating in room temperature air which allows two resistors to be compared with accuracy's to 2 part in 10^{-8} . The Accubridge is used to compare the QHR device directly to a 1000-ohm standard resistor. The bridge can also be used to measure the field dependence of R_{xx} and R_{xy} , to make precision measurements of R_{xx} 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 (Fully automated) from the 1000 ohm resistor to establish values for 1, 10, 100, 1K, 10K and 13K Ohm primary resistors to a very high level of accuracy. The Accubridge can be used stand-alone or with Measurements International's Accubridge software for automated measurements.

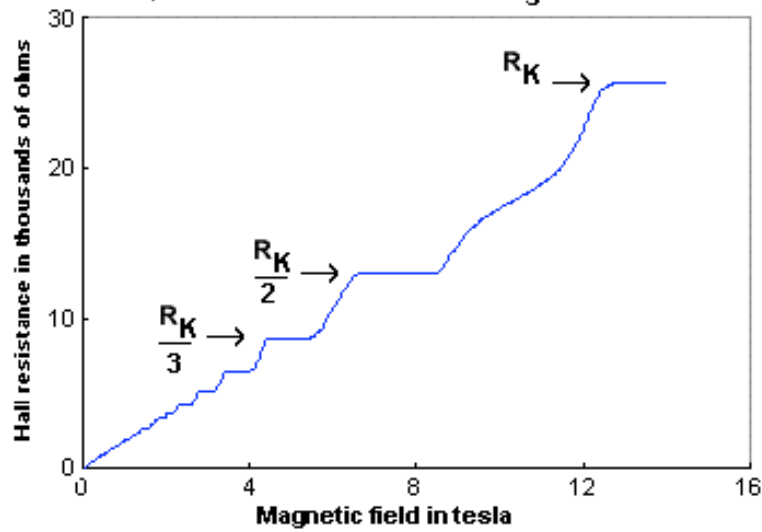
The 6800A system is modular in design and the three parts, the 6800A system sample, the 6800A System Cryogenics and the 6800A Resistance Bridge may be purchased separately. Several options are available to the user including extra QHR samples, 6800A software, a stainless steel liquid helium transfer line to allow continuous operation, a high precision oil resistor bath (Model 9400) or a high precision temperature control air bath (Model 9300A).



Model 6800A



Quantized Hall resistor in magnetic field



Model 6800A

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 1.5 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.

Specifications:

Accuracy (QHR:1k Ω)	2×10^{-8}
Accuracy (1 to 10k Ω) <small>Max Ratio 13:1</small>	2×10^{-8}
Accuracy (0.1 Ω :1 Ω)	1×10^{-7}
Stability	$< 1 \times 10^{-8}$
Insulation Resistance	$>10^{13}$ Ohms
Magnet Strength	8 Tesla (Optional 9 Tesla)
Plateaus	i=2
Temperature	⁴ He, 1.2K
Dewar Size	50 liter
Operating Environment	18 to 34°C, 10 to 80% RH
Warranty	3 Year Parts & Labor

Dimensions:

122 x 49 x 46 cm (Rack)

Weight:

115 kg

Shipping Weight:

137 kg

Accessories:

4220A

QHR Sample

9400

9300A

6800A Software

Helium Transfer Line

Transfer Dewar (Optional 100 liter or 250 liter)

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

Data Subject to Change

Printed in Canada



Measurements International

118 Commerce Dr., PO Box 2359, Prescott, Canada K0E 1T0
Ph. 613.925.5934 • Fx. 613.925.1195 • North America: 1.800.324.4988