



100-Series High Resistance Standards Instruction Manual



Copyright 2006 Ohm-Labs, Inc.

100-Series High Resistance Standards Instruction Manual

1. General

Ohm-Labs' 100-Series High Resistance Standards are designed as transportable or laboratory references for maintaining the ohm at levels between one megohm and ten teraohms. Based on recent advances in measurement and construction, each standard is individually manufactured from selected resistance elements which have been processed for good long term stability. Internal guarding and electrical isolation of terminals reduce errors caused by leakage currents. Hermetically sealed, these standards are highly immune from changes in barometric pressure and relative humidity. All models are supplied with a traceable report of calibration at two voltages. These standards are recommended for use at an ambient temperature near 23 °C. A thermistor in close proximity to the internal resistance element is provided for monitoring purposes. This thermistor is electrically isolated from both the case and the internal element.

The 100-Series High Resistance Standards are offered in decade values. Non-decade values are available by special order.

2. Specifications

| Model Number | Nominal Resistance | Tolerance in ppm | Internal Guard | Temperature Coefficient | Voltage Coefficient | 12 month Stability | Recom. Voltage | Max. Voltage |
|--|--------------------|------------------|----------------|-------------------------|---------------------|--------------------|----------------|--------------|
| 106 | 1 Meg | 5 | 1 Meg | <1 ppm / °C | <0.1 ppm / V | <5 ppm | 10 | 100 |
| 107 | 10 Meg | 10 | 10 M | 1 | 1 | 10 | 20 | 300 |
| 108 | 100 Meg | 20 | 100 M | 10 | 1 | 20 | 50 | 1000 |
| 109 | 1 Gig | 50 | 1 G | 25 | 1 | 25 | 100 | 1000 |
| 110 | 10 Gig | 200 | 1 G | 50 | 5 | 50 | 100 | 1000 |
| 100-Series Ultra-High Resistance Standards | | | | | | | | |
| 111 | 100 Gig | 500 | 1 G | 100 | 5 | 100 | 200 | 3000 |
| 112 | 1 Tera | 1000 | 1 G | 200 | 5 | 200 | 200 | 3000 |
| 113 | 10 Tera | 3000 | 1 G | 300 | 10 | 500 | 500 | 3000 |

Notes:

Tolerance is accuracy at time of manufacture, stated within the absolute accuracy listed.

Temperature coefficient is at 23 °C +/-5 °C.

Voltage coefficient is at recommended voltage -50 % / +100 %.

Internal thermistor = 10,000 ohms (nominal) at 25 °C

Physical:

106-110: 178 x 75 x 100 mm / 7" x 3" x 4"; 1.5 kG / 3 #

111-113: 228 x 125 x 125 mm / 9" x 5" x 5"; 2.5 kG / 5 #

Accessories and options available:

External guard terminal (omit internal guard resistor)

BPO female to BNC adaptor (specify EL4302 for BNC male or EL4303 for BNC female)

1 m cables: BPO to BNC male (specify EL4305), thermistor (2 mm plug) to spade lug cable (EL4111), thermistor to 4 mm banana plug cable (EL4112)

Protective caps for BPO connectors (EL4320)

100-Series High Resistance Standards Instruction Manual

3. Use

On receipt, inspect the standard for physical damage. If damaged, please immediately contact the carrier. We will assist with any damage claims and/or necessary repair.

Review the Report of Calibration accompanying the standard. The reported value is at 23 °C.

These standards must be used in a guarded measurement system to realize their stated accuracy. An internal resistor connects the coaxial shields to provide a return path for the guard circuit current. This resistor is nominally equal to the value of the standard in models up to 1 G. Models above 1 G all have a guard path resistor of 1 G. (Note: in models with an external guard terminal, this resistor is omitted, and the internal resistor housing is connected directly to the Guard terminal).

Connections are made with silver plated BPO (British Post Office) type coaxial connectors. These connectors slide in and out. Either terminal may be high.

For best measurement accuracy, do not exceed the maximum voltage rating of the standard.

Allow 24 hours for the standard to acclimatize at ambient temperature (23 °C nominal). The internal temperature of the standard may be monitored via the internal thermistor.

Caution: Application of voltage in excess of the rated maximum may damage or destroy these standards.

100-Series High Resistance Standards Instruction Manual

4. Temperature and Voltage Coefficients of Resistance

Each high resistance standard's report of calibration includes its measured value at 23 °C (nominal) at two voltages.

The difference between these two values, divided by the voltage difference between the two measurements, gives the standard's voltage coefficient (in Volts / Volt). Barring damage, the voltage coefficient of resistance will not change significantly over the life of the standard and does not need to be re-determined.

The alpha (α) temperature coefficient of resistance is the change in resistance with temperature at 23 °C; the beta (β) coefficient is the curvature of this change. Within a temperature range around ambient (18 ° - 30 °C), the resistance of a standard may be accurately expressed as:

$$R_t = R_{23}[1 + \alpha(t-23) + \beta(t-23)^2]$$

Where:

| | | |
|----------|---|-------------------------------|
| R_t | = | Resistance at temperature 't' |
| R_{23} | = | Resistance at 23 °C |
| t | = | Temperature of resistor |

5. Maintenance and Repair

No maintenance is required. The fluoropolymer mounts around the BPO plugs must be kept free from oil and other contaminants. These mounts may be occasionally cleaned with ethanol. To slow tarnishing of the silver plated BPO plugs, keep the protective caps in place when not in use. The plugs may be cleaned with a silver polishing cloth. Repairs must be performed by the manufacturer.

6. Calibration

Periodically recertify the resistance of the standard at its recommended temperature and voltage. The calibration cycle will depend on the user's needs. We recommend annual calibration. Please return the standard to the manufacturer (or to another qualified laboratory) for calibration.

7. Storage and Shipment

Never use expanding foam fill around resistance standards; the heat generated can permanently shift the value. Do not expose the standard to temperatures above 40°C. Protect from shock and extreme vibration. Handle as you would any other precision instrument. Shipment during cooler months is recommended.

8. Warrantee

These standards are warranted for five years from the date of shipment. Please see our Terms & Conditions for additional information.