1000-Series Low Resistance Standards
Instruction Manual

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Instruction Manual

1) General

Ohm-Labs' 1000-Series Low Resistance Standards are designed as transportable or laboratory references for maintaining the ohm at levels between ten micro-ohms and one ohm. Based on modern techniques of processing and construction, each standard is individually constructed from selected resistance alloy and is carefully processed for low temperature coefficients of resistance and long term stability. All models are supplied with an ISO17025 accredited report of calibration. The 1000-Series are recommended for use at an ambient temperature near 23 °C.

1000-Series standards are available in decade and intermediate resistance values.

2) Specifications

Model Number	Nominal Resistance	Initial Tolerance	Recom. Current	Max Current	Temperature Coefficient	Initial 12 mo. Stability
1000	1 Ohm	<5 ppm	0.3 Amp	1 Amp	<1 ppm / °C	<5 ppm
1001	0.1	10	1	3	1	5
1002	0.01	20	3	10	2	10
1003	0.001	50	10	30	5	20
1004	0.000 1	100	30	100	20	50
1005	0.000 01	300	100	100	50	100
1006	0.000 001	500	100	100	50	100
For non-decade values, specify: (1=1000 series)+(range)+(multiplier), per the below examples						
1001-19	0.19 Ohm	20	1	2	Use specifications from next lower resistance model for non-decade values.	
1002-25	0.025	50	2	5		
1004-3	0.000 3	300	20	50		

Notes:
Tolerance is accuracy at time of manufacture
Temperature coefficient is at 23 +/-5 °C

Physical:
228 x 125 x 125 mm (9" x 5" x 5"); 2.5 kg (5 #)

Options available:
Installed 10K thermistor
Transit container, foam lined for protection during shipment (holds 2-4 standards)

Environmental Limits: 0-40 °C, 0-95 %RH, protect from shock or excessive vibration

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 reference value is at 23 °C.

These standards must be used as four-terminal resistors to realize their stated accuracy. Make current and potential connections via the binding posts on the top of the standard. The standard is screened to identify these terminals.

Connection may be made with bare wire, spade lugs or 4 mm banana plugs. Wire may be passed through the hole in the binding post, or wrapped around the post. Do not over tighten the binding posts; a snug finger tight pressure is adequate.

Allow 24 hours for the standard to acclimatize at ambient temperature (23 °C nominal).

For best measurement accuracy, do not exceed the current ratings of the standard. Although application of up to two times the rated current will not damage these standards, self-heating will change the resistance from the reported value.

Caution: Application of current in excess of two times the rated value may permanently shift the resistance of these standards.

4) Measured Value, Temperature & Power Coefficients of Resistance

Each standard's Report of Calibration includes its measured resistance and its temperature coefficients of resistance at 23.0 °C. Measurements are provided at 25, 50, 75 & 100 % rated current. Current through the resistor produces self-heating, which changes the resistance of the standard. This change is the power coefficient of the resistor; it is directly related to the temperature coefficient. Barring damage, the temperature coefficients of a resistance standard will not change appreciably over time.

The alpha (α) coefficient is the change in resistance with temperature at 23 °C; the beta (β) coefficient is the curvature of this change. Near 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

Each resistor is supplied with a table of resistance versus temperature based on the reference value at 23.0 °C. As a visual aid, this data is also presented in a graph.

Applied current will heat the standard. This heat will cause a change in resistance. The power coefficient of resistance is related to the temperature coefficient; the only difference is that the resistor element is heated internally under power and externally by ambient temperature. If the standard is being used for current measurement, improved accuracy can be obtained by calibrating the standard at the desired measurement currents, and using this calibrated value during tests. This characterization can be provided on request.

5) Maintenance and Repair

Other than occasional cleaning, no maintenance is required. Repairs must be performed by the manufacturer.

6) Calibration

Periodically measure the resistance of the standard at 23.0 °C. The calibration cycle depends on the user's needs; annual calibration is the most common cycle. The recommended calibration method is comparison with a calibrated resistance standard using a current comparator bridge with range extender. Additional technical information on resistance calibration is on our website.

7) Storage and Shipment

Do not expose the standard to temperatures above 40 °C. Never use expanding foam to package resistance standards, as elevated temperatures may permanently shift the resistance. Protect from shock and extreme vibration. Handle as you would any other precision instrument.

8) Warrantee

The 1000-series of Low Resistance Standards are warranted for five years from the date of shipment. Please see our Terms & Conditions for additional information. Additional information is available on our website, at www.ohm-labs.com.

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