Excellence in Resistance

1000-Series
Instruction Manual for
Low Resistance Standards

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Instruction Manual for
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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 good long term stability. All models are supplied with a traceable report of calibration. The 1000-Series are recommended for use at an ambient temperature near 23 °C.

1000-Series standards are offered in both decade and intermediate values.

2) Specifications

Model Number	Nominal Resistance	Initial Tolerance	Recom. Current	Max Current	Temperature Coefficients	Initial 12 mo. Stability
1000	1 Ohm	< 0.02 %	0.3 Amp	1 Amp	α < 20 ppm / °C β < 2 ppm / °C	< 10 ppm
1001	0.1	< 0.05	1	3		
1002	0.01	< 0.1	3	10		
1003	0.001	< 0.2	10	30		< 20 ppm
1004	0.000 1	< 0.25	30	100		< 50 ppm
1005	0.000 01	< 0.5	100	300		
For non-decade values, specify: (1=1000 series)+(multiplier)+(range), per the below examples						
1191	0.19 Ohm	< 0.05	1	2	Use specifications from next higher current level model for non-decade values.	
1252	0.025	< 0.2	2	5		
1304	0.000 3	< 0.5	20	50		

Notes:
Tolerance is accuracy at time of manufacture
Temperature coefficient is at nominal 23 °C +/-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 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 reported 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. An additional measurement is provided after 30 minutes at 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 25 °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:

$$R_t = R_{25}[1+\alpha(t-25)+\beta(t-25)^2]$$

Where:

R_t	=	Resistance at temperature 't'
R_{25}	=	Resistance at 25 °C
t	=	Temperature of resistor

Each resistor is supplied with a table of corrections in parts per million (or micro-ohms per ohm) of the value at 23.0 °C. As a visual aid, this data is also presented in a graph.

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. The manufacturer can provide this characterization 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 will depend on the user's needs. Annual calibration is the most common cycle. Please return the standard to us at the below address (or send it to another qualified laboratory) for calibration.

7) Storage and Shipment

Do not expose the standard to temperatures above 40 °C. Never use expanding foam to package resistance standards. Elevated temperatures may permanently shift their 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.