



200-Series
Resistance Standards
Instruction Manual



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200-Series Resistance Standards Instruction Manual

1) General

Ohm-Labs' 200-Series Resistance Standards are designed as primary laboratory references for maintaining the ohm at levels from one ohm to ten megohms. Based on the most recent research in materials and processing, each standard is individually wound and carefully processed for low temperature coefficients of resistance and long term stability. Hermetically sealed, these standards are highly immune from changes in barometric pressure and relative humidity. Gold plated terminals feature independently rotating barrels to reduce lead wire deformation. All models are supplied with a traceable report of calibration, including temperature coefficient data. This series is recommended for use in a constant temperature oil bath maintained at 25 °C.

The 200-Series are offered in decade values and in –T values for thermometry, and –Q values for use with a Quantum Hall System. Special values are available upon request.

2) Specifications

Model Number	Nominal Resistance	Tolerance in ppm	Rated Current	Typical Coefficients	Initial 12 mo. Stability
200	1 Ohm	<3	100 mA	Temperature: $\alpha < 1 \text{ ppm} / ^\circ\text{C}$ $\beta < 0.1 \text{ ppm} / ^\circ\text{C}$	<2 ppm
201	10	<5	30		< 3
201-T	25	<5	25		< 3
202	100	<3	10		< 3
203	1000	<5	3		< 3
203-Q	6400	< 10	1.25	Voltage < 0.1 ppm / V	< 5
204	10 K	<3	1		< 2
204-Q	12.9 K	< 10	1		< 5
205	100 K	<5	0.3	Pressure < 0.1 ppm / kPa	< 3
206	1 Meg	<5	0.1		< 3
207	10 Meg	<10	0.03		< 5

Notes:

Tolerance is accuracy at time of manufacture
Temperature coefficient is at nominal 25 +/-5 °C.

Physical:

127 mm dia. x 165 mm high (5" x 6.5"); 4.5 kg (10 #)

Environmental Limits (Storage):

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

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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 measured value is reported at 25.00 °C (+/- 0.01 °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 lid is engraved to identify these terminals.

Connection may be made with bare or silver plated solid copper wire, gold plated copper spade lugs or gold plated 4mm 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. The rotating barrels on the binding posts will reduce wire deformation.

Using the lead wires, or by lassoing a 50 cm length of wire around the resistor body, gently lower the standard into a constant temperature oil bath maintained at 25 °C.

Allow 72 hours for the standard to acclimatize.

For best measurement accuracy, do not exceed the current ratings of the standard. Although application of up to three 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 three times the rated value may permanently shift the resistance of these standards.

4) Measured Value and Temperature Coefficients of Resistance

Each standard's Report of Calibration includes its measured value at 25.00 °C and its alpha and beta temperature coefficients of resistance. Barring damage, the temperature coefficients of resistance will not change over the life of the standard.

The alpha (α) coefficient is the change in resistance with temperature at 25 °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:

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

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 25.00 °C. As a visual aid, this data is also presented in a graph.

5) Maintenance and Repair

No maintenance is required. Repairs must be performed by the manufacturer.

6) Calibration

Periodically recertify the resistance of the standard at its recommended temperature. The calibration cycle will depend on the user's needs. To develop drift history on the resistor, a useful cycle is every three months for the first year, every six months for the second and third years, and annually thereafter. As the resistor settles into its long term behavior, the calibration cycle may be extended to two, three or five years. Ohm-Labs provides ISO17025 accredited calibration support.

The calibration method is comparison against a reference standard using a current comparator bridge.

7) Storage and Shipment

Do not expose the standard to temperatures above 40 °C. Protect from shock and extreme vibration. Handle as you would any other precision instrument. Never use expanding foam to package the resistor, as the heat generated may permanently shift its value. Shipment during cooler months is recommended. The 200-series are designed to withstand commercial shipment by ground or air without degradation of performance or significant shift in resistance value.

8) Warrantee

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