



# 100-Series Resistance Standards Instruction Manual



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# 100-Series Resistance Standards Instruction Manual

## 1) General

Ohm-Labs' 100-Series Resistance Standards are designed as transportable or laboratory references for maintaining the ohm at levels between one ohm and ten megohms. Based on modern techniques of processing and construction, each standard is individually manufactured from selected resistance alloy and is 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. All models are supplied with a traceable report of calibration, including temperature coefficient data. These standards are recommended for use at an ambient temperature of 23 +/-5 °C.

100-Series Standards are available in decade, thermometry and special values.

## 2) Specifications

Model Number	Nominal Resistance	Tolerance in ppm	Nominal Current	Maximum Current	Typical Coefficients	Initial 12 mo. Stability
100	1 Ohm	<3	100 mA	1 A	Temperature: 1-10K: <0.2 ppm / °C 100K: <0.3 ppm / °C 1M: <0.5 ppm / °C 10M: <1 ppm / °C Voltage < 0.1 ppm / V Pressure < 0.1 ppm / kPa	<3 ppm
101	10	<3	30	100 mA		< 3
101-T	25	<3	10	100		< 3
102	100	<3	10	30		< 3
103	1 K	<3	3	10		< 3
104	10 K	<3	1	3		< 3
105	100 K	<5	0.3	1		< 5
106	1 Meg	<10	0.1	0.3		< 10
107	10 Meg	<20	0.03	0.1		< 10
For non-decade values, specify: (1=100 series)+(multiplier)+(range)						
Examples	11.90	1.9	<5	Temperature, voltage & pressure coefficients, and stability, similar to above.		
	12.51	25	<5			
	142	400	<5			

### Notes:

Tolerance is accuracy at time of manufacture, at 10 mW power (nominal current)  
 Temperature coefficient is at 23 +/-5 °C.

### Physical:

12.5 x 8 x 8.5 cm (4.9 x 3.15 x 3.25 in.); 1 kg (2 lbs)

### Options available:

Installed 10K thermistor with standard dual miniature banana jack  
 Transit case, foam lined for protection during shipment (holds 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 reported value is at 23 °C.

At 10 KΩ and below, 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 copper wire, 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 terminals are marked for Current (C) and Potential (P). On 4-wire ohmmeters, connect C to Input and P to Sense. Resistors below 10 K should always be measured in 4-wire mode. A ground terminal is provided for the case.

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 momentary application of current above the rated value will not damage these standards, self-heating will change the resistance from the reported value.

**Caution: Do not exceed maximum rated current. Damage may occur.**

### 4) Measured Value and Temperature Coefficients of Resistance

Each standard's Report of Calibration includes its measured value at 23 °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 and do not need to be re-determined.

The alpha ( $\alpha$ ) coefficient is the change in resistance with temperature at 23 °C; the beta ( $\beta$ ) 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

Each resistor is supplied with a table of resistance versus temperature. 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. We recommend annual calibration. Please return the standard to us at the below address (or send it to another qualified laboratory) for calibration.

The calibration method is comparison against a calibrated reference standard (such as Ohm-Labs' 200-Series) using a current comparator bridge. Less accurate calibration may also be performed using Wheatstone or Kelvin type bridges, or a long scale multimeter. The substitution method is recommended if using these devices.

## 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. 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.