



TECHNICAL MANUAL

FOR

MODEL 7330 SERIES

AC/DC RESISTANCE STANDARDS

FOR USE IN OIL

NOTICE

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TM7330-A-00
15 October 2017

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1. INTRODUCTION

The Guildline Model 7330 series of AC/DC Resistance Standards, ranging from 1 Ω to 10 k Ω , are designed as very high stability calibration laboratory standards for high accuracy resistance calibration in oil (see Figure 1). These standards are designed for use in both DC applications as well as AC..



Figure 1-1: 7330 Resistance Standard

They can be used as working standards, or highly reliable and rugged transportable transfer standards. They are extremely useful for use as a reference standard with a resistance or temperature bridge; the calibration of resistance ranges of multi-function calibrators and high accuracy digital multimeters; as well as for use in more classical standards and calibration laboratory applications where the need for high accuracy values is required.

The resistor elements are securely mounted to the inside of a rugged aluminum enclosure with openings designed to maximize the flow of oil through the standard. The resistive elements are specially constructed to minimize the effects of ambient conditions on the stability of the resistor. Further precautions are taken in the resistor construction to minimize the effects of thermal emf's and elimination of leakage at the terminals. Five binding post connections on the top are provided (see Figure 1). The C1 and C2 connections are used to apply the test current or voltage to the resistor. The P1 and P2 connections are used to measure the resistance. The fifth connection is for chassis ground.

Note that during the calibration of a 7330, the resistor has been immersed in oil. Traces of this oil may still be evident when the resistor is received. These oil traces do not indicate a problem with the resistor or leakage in the resistor.

Maintenance of the resistor consists only of routinely inspecting the unit for physical damage and cleanliness. They should be cleaned with isopropanol, and a soft brush or cloth. Special care should be taken to ensure the terminal connections and insulators are clean.

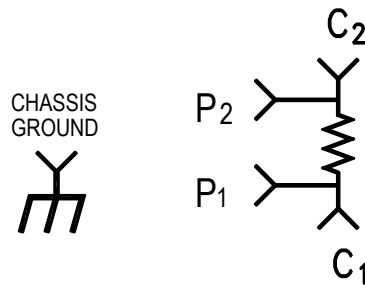


Figure 1-2: 4 Wire 7330 Schematic

2. AC CHARACTERISTICS

The impedance of the resistor is expressed as:

$$Z(f) = R(f) \cdot (1 + j \cdot 2\pi f \tau)$$

Where $R(f)$ is the real part of the impedance, f is the frequency in Hz and τ is the time constant of the standard. Parameter $R(0)$ is the resistance measured with DC energisation. The 7330 standards have very flat frequency response. The resistive component is virtually independent of frequency, with far less than 0.8 ppm of AC/DC difference between DC and 1000 Hz (i.e. 1 kHz). The 7330 series of standards are almost purely resistive with very small time constant. For a 7330-100 Ω , the time constant is typically less than 10ns. The resistors used in the 7330 Standards are identical to those used in Guildline 7334 Air Based AC/DC Standards. The following charts show the frequency response of the elements used in the 7334 and 7330 Resistance Standards.

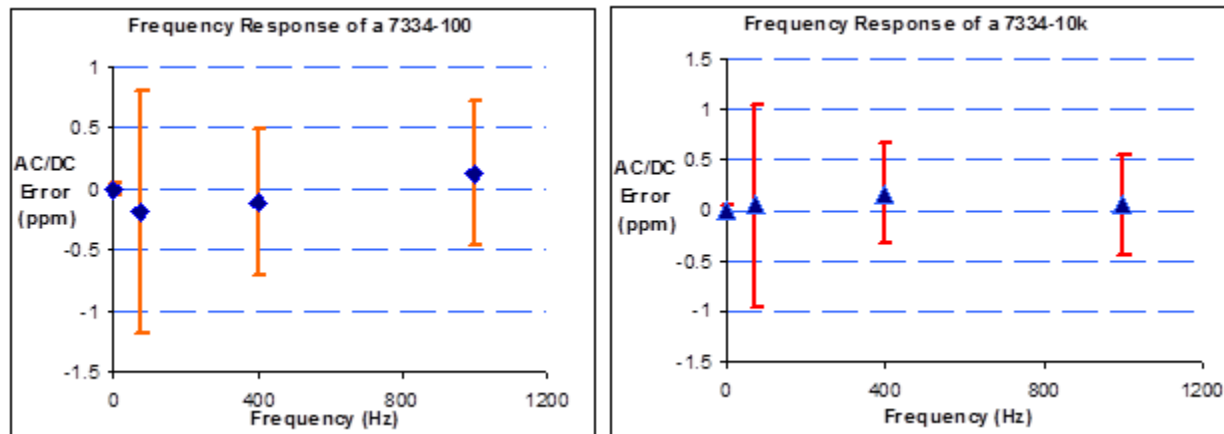


Figure 2-1: AC/DC Error of a 7334-100Ω and a 7334-10kΩ¹

Calibrated by National Physical Laboratory (NPL) of UK
 Note 1: The 7330 Resistor Elements are identical to the 7334 Resistor Elements

The AC/DC difference is so insignificant that it is almost negligible, when compared to measurement noise. A user can confidently use the Guildline model 7330 for DC resistance calibration, as a reference with an AC temperature bridge, as an AC impedance standard, or elsewhere in AC/DC metrology that calls for a stable, precision standard.

3. 7330 SERIES SPECIFICATIONS

GENERAL SPECIFICATIONS						
Environmental	Temperature			Humidity		
Operating	18 °C to 28 °C			<70 % RH non-condensing		
Storage	-20 °C to 60 °C			15 % to 80 % RH		
Dimensions	Height		Diameter		Weight	
	mm	Inches	mm	Inches	kg	lbs
	109.2	4.3	95.3	3.75	0.545	1.2

Model (Nominal Ω)	Nominal Value (Ω)	Initial ¹ Tolerance ± ppm	Stability 12 Months ± ppm	Typical AC/DC Difference @ 1 kHz (± ppm)	Maximum Excitation (mA)	Temperature Coefficient ³ ± ppm/°C
7330-1	1	2	2.5	<3.0	320	0.25
7330-2.5	2.5	2	2.5	<3.0	200	0.25
7330-10	10	2	2	<1.0	100	0.2
7330-25	25	2	2	<1.0	64	0.2
7330-100	100	2	2	<1.0	32	0.2
7330-300	300	2	2	<1.0	19	0.2
7330-400	400	2	2	<1.0	16	0.2
7330-1k	1k	2	2	<1.0	10	0.2
7330-10k	10k	2	2	<1.0	3.2	0.2

Special values including 1.9X are available upon request.

Note 1: Nominal initial tolerance is defined as the maximum variation of resistance mean values as initially adjusted at the point of sale.

Note 2: Calibrated under DC excitation, in air at 21, 23 and 25 °C referred to the unit of resistance as maintained by a NMI, and expressed as a total uncertainty with a coverage factor of k = 2. A traceable report of calibration stating the measured values and uncertainty is provided with each resistor.

Note 3: Temperature Coefficient <0.0003 ppm/°C ambient when used with a Guildline 5600 Oil Bath. Temperature hysteresis < 0.3 ppm between 0 °C and 40 °C. Voltage hysteresis negligible to < 0.1 ppm.