9333 Series

Precision Secondary Air Resistance Standards

Low Priced - High Performance - Laboratory Grade Air Resistance Standards!

Guildline Instruments NEW 9333 Series of Air Resistance Standards are cost effective laboratory, portable or just general purpose resistance standards. They are very stable and are designed to be used across a wide temperature range.

The 9333 Series unique small size and ruggedized case, coupled with the Series low temperature coefficient, makes these Resistance Standards ideal for applications outside of a laboratory environment or for education institutes who typically encounter a wider temperature environment. These Standards are at home either in a controlled environment or in a wide temperature environment from 18 °C to 28 °C.

The 9333 Precision Resistance Standards are the best available low cost standards in a wide range of Decade and custom values between 1 mΩ to 1 GΩ Including 1.9x and Other Values!

All models include 5-way beryllium copper, gold plated binding posts constructed of low-thermal EMF material for voltage measurements as well as current connections. One additional terminal is provided for a case ground connection.

For resistance Values 1 MΩ and below, four 5-way binding posts are used for true 4-Wire resistance measurements. These terminals are compliant with standard banana cable size spacing and are color coded for easy visual connections. Values from 10 MΩ and above have two binding posts for the resistance with one additional terminal for guard/ground. Guildline's unique design for these resistance values include the use of high isolation to allow for voltages up to 1500 V.

Other custom values are available for full scale and linearity verification of micro, milli and other measurement devices not having common ranges. If you have a special resistance application between 1 mΩ and 1 GΩ, Guildline can supply a 9333 standard to fulfill your needs.

FEATURES

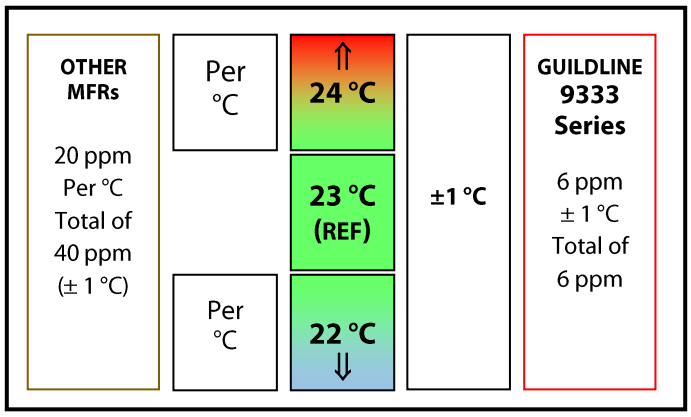
- Wide Resistance Range 1 mΩ to 1 GΩ
- Wide Operating Range 18 °C to 28 °C
- 1 Year Stabilities as Low as 5 ppm
- Low Cost - High Performance
- ISO/IEC 17025 Calibration Included
- Compact and Ruggedized
- Voltages to 1500 V for High Values
- Low Temperature Coefficients
- Outstanding Initial Accuracy
- Guard and Shield Compliant
- Special Values Available On Request

9333 Series of Precision Secondary AIR Resistance Standards

Don't be fooled by other manufacturers low cost "Resistance Standards". Compare their performance to the new 9333 Series and see the value of using a Guildline standard! Just look at the 9333 Specifications versus another manufacturer's low cost units. First consider accuracy – Guildline's 9333 Series is typically 10x better.

Value (Ω)	MFR	Initial Tolerance (±)	Stability 1 year (±)	Temperature Coefficient
XXX-0.01 Ω	**MFR A**	200 ppm	50 ppm	± 20 ppm per °C
9333-0.01 Ω	**Guildline**	20 ppm	12 ppm	6 ppm / ± 1 °C

Consider when these standards are used in a real world "general" temperature environment of 23 °C ± 1 °C. Remember the Temperature Coefficient for MFR A is per/°C while the 9333 Series is per ± 1 °C (read specifications carefully). This is shown visually to the right!



Now consider a wider temperature environment typically present when using secondary standards (e.g. ± 5 °C) and look at total uncertainty. Mathematically summing the uncertainties associated with the preceding 0.01 Ω unit from another company results in a total uncertainty of 250 ppm [i.e. 50 ppm (stability) + 200 ppm (temperature affects adjustment +5 °C at 20 ppm/°C and -5 °C at 20 ppm/°C)]. Applying a general rule of 4 to 1, this allows you to calibrate only instruments with a 0.1 % or larger specification.

Do the same for the Guildline 9333-0.01 and you will find that the total uncertainty is only 42 ppm [i.e. 12 ppm (stability) + 30 ppm (temperature effect of ± 5 °C at 6 ppm)]. This means a 9333 0.01 Ω resistor can be used to calibrate instruments at 0.02 % - 5 times better than the competition!

And it is not just about listing paper specifications, but actually having the manufacturing capability and experience to make a true resistance standard. Guildline has been manufacturing precision resistance standards since 1957.

Look at the high quality build of the 9333 Series. There is nothing cost-cutting found here. From a compact and shielded case, to the best high quality 5-Way beryllium copper and GOLD plated terminals, these cost effective Resistance Standards are in fact much better than most manufacturers primary line of Resistance Standards.

Add the ISO 17025 Calibration, which is included at no extra charge, and you have an unbelievable value for a Resistance Standard.

Specifications for 9333 - 4 Terminal Models

Model (Nominal Ω)	Initial [1] Tolerance (± ppm)	Stability (± ppm) [2]	Maximum Limits [3]		Temperature Coefficient ppm/± 1 °C	Voltage [4] Coefficient ± ppm/Vdc
			Current (Adc)	Voltage (Vdc)		
9333-0.001	50	35	10 A	0.01	20	NA
9333-0.01	20	12	3 A	0.03	6	NA
9333-0.1	15	10	1 A	0.1	5	NA
9333-1	10	5	320 mA	0.32	2	NA
9333-10	10	5	100 mA	1	2	NA
9333-100	10	5	32 mA	3.2	2	NA
9333-1k	10	5	10 mA	10	2	NA
9333-10k	10	5	3.2 mA	32	2	0.01
9333-100k	15	7	1 mA	100	2	0.03
9333-1M	15	22	0.32 mA	320	5	0.05

Specifications for 9333 - High Values (2-Wire)

Model (Nominal Ω)	Initial [1] Tolerance (± ppm)	Stability (± ppm) [2]	Maximum Limits [3]		Temperature Coefficient ppm/± 1 °C	Voltage [4] Coefficient ± ppm/Vdc
			Current (µAdc)	Voltage (Vdc)		
9333-10M	20	25	100	1000	6	0.3
9333-100M	35	50	15	1500	6	1.0
9333-1G	100	500	1.5	1500	25	1.5

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 in air at 23 °C traceable to the SI unit of electric resistance, calibration uncertainties expanded and expressed at the 95 % level of confidence. An ISO/IEC 17025 accredited certificate and report of calibration stating the calibrated value and estimated uncertainty is provided with each resistor.

Note 3: Resistance Standards are typically calibrated at 10 mW of power or less.

Note 4: Voltage hysteresis: negligible to < 0.1 ppm. Temperature hysteresis: < 0.3 ppm between 0 °C and 40 °C.

Note 5: Special/Custom Values available upon request including 1.9x values.

General Specifications (All Models)

Temperature (All Models)		Operating Humidity (Non-Condensing)		Storage Humidity (Non-Condensing)	
Operating	**Storage**	(Models ≤ 1 MΩ)	(Models ≥ 10 MΩ)	(Models ≤ 1 MΩ)	(Models ≥ 10 MΩ)
18 °C to 28 °C	-20 °C to 60 °C	15 % to 70 % RH	15 % to 50 % RH	15 % to 80 % RH	15 % to 80 % RH

Dimensions	Height		Width		Depth		Weight		Shipping Weight	
All Models	88 mm	3.5″	124 mm	4.9″	79 mm	3.1″	.63 kg	1.4 lbs	1 kg	2.2 lbs

9333 Series of Precision Secondary AIR Resistance Standards

Need better uncertainties? Looking for oil based resistance standards? Need AC performance or a better decade standard or PRT Simulator? Guildline has all these and more!

For absolute top of the line performance, be sure to check out our 6634A and 6636 Temperature Stabilized Series of Resistance Standards. The resistance elements are enclosed in a temperature regulated chamber, are electrically isolated, and are bonded to an aluminum block to reduce thermal gradients in the inner chamber. These Standards provide the best available resistance specifications with temperature coefficients as low as +/- 0.005 ppm/°C. Multiple values from 4 to 10 elements can be placed in a single enclosure.

Having developed the most advanced series of Fluid Baths (see our Model 5600 Series), Guildline has now designed a new 7330 Oil Based AC/DC Primary Resistance Standard to allow customers to get the highest performance for oil based standards whether in our new 5600 Series of Fluid Baths or in their own oil bath.

Guildline provides the widest range and best performing commercially available "AIR" resistance standards. The range of these 9334A ultra precise resistance standards is from 1 micro-ohm to 10 peta-ohm (i.e. 1 μΩ to 10 PΩ). No other company in the world offers this range of resistance standards. For very low and very high resistance values, Guildline's Resistance Standards are unique in terms of values offered, accuracies, uncertainties and annual drift.

Guildline's 7334 Series of AC/DC Resistance Standards are designed for high accuracy resistance calibration in air, without the need for stabilization in a temperature bath. These standards are suitable for both AC and DC applications and essentially have no AC/DC difference at power frequencies (i.e. ≤ 1 kHz).

Guildline provides multiple offerings for decade standards and PRT standards. The 9340 Series are the best in performance for Decade Standards, while the new 9340-4T is an amazing new 4-Wire Decade standard with values going down to 1 μΩ!

Go to www.guildline.com or email sales@guildline.com for more information on all our resistance standards.

Ordering Information	
9333-Model	Resistance Standard (List Decade Ohmic Value For Model)
/TM	Technical Manual (Included)
/CC	Certificate of Conformance (Included)
/Report	ISO/IEC 17025 Accredited Calibration Certificate Included!
9333-Model	1.9X Value (eg 1.9 Ω, 190 Ω) – Specify 1.9 Value
9333-X	Customer Specified Value (State Value between 1mΩ and 1G)
	Custom Models Include /CC and /Report
Lead-10	Low Thermal Lead Set with Gold Plated Bananas
Many Precision Leads Sets Are Available – Please Contact Guildline	

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