6634A SERIES

TEMPERATURE STABILIZED RESISTANCE STANDARDS

Perfect for Automated Measurement Systems or as a Primary Laboratory Resistance Standard





GUILDLINE INSTRUMENTS 6634A SERIES is a modular series of Resistance Standards that can be rack mountable or simply set on a bench. The 6634A Series provides a set of up to 10 precision resistance standards enclosed in a temperature controlled and EMI protected chamber.

THE 6634A SERIES IS AN EXCELLENT SOLUTION AS A WORKING STANDARD FOR AUTOMATED RESISTANCE MEASUREMENT SYSTEMS OR AS A STAND-ALONE LABORATORY PRIMARY RESISTANCE STANDARD!

For the Normal Ohms Configurations, there are 10 standard resistance values available covering the range of 0.1 Ω to 100 MΩ. Each resistance element is isolated and has 4-terminal connections on the rear panel. The resistance elements are maintained at approximately 30 °C in a temperature stabilized chamber. Each element is built with Guildline's "true" multi-element design.

Optional higher chamber temperature set points of 35 °C and 40 °C are available on request. Temperature monitoring is provided by a precision PRT sensor installed in the chamber with 4 terminal connectors provided on the front panel.

The Model 6634A is excellent as a Working Standard for Automated Resistance Measurement Systems or as Reference Standards at the Primary level. Special resistance values are available in the range of 0.001 Ω to 100 MΩ.

Standard model variations are available with 5, 6, 7, 8, 9 or 10 resistance elements installed. All models purchased with less than 10 resistance standards can be expanded at any time via a factory upgrade. Special resistance values can also be ordered.

A **New** LOW Ohms Configuration is now available for values below 0.1 Ω. This Series has the same precision temperature stability as the Normal Ohms Configuration, but is limited to a maximum of 3 Resistance Elements. This is due to the large size of the low ohmic elements. The Resistance Range of the Low Ohms models is from 1 mΩ to 100 mΩ.

FEATURES

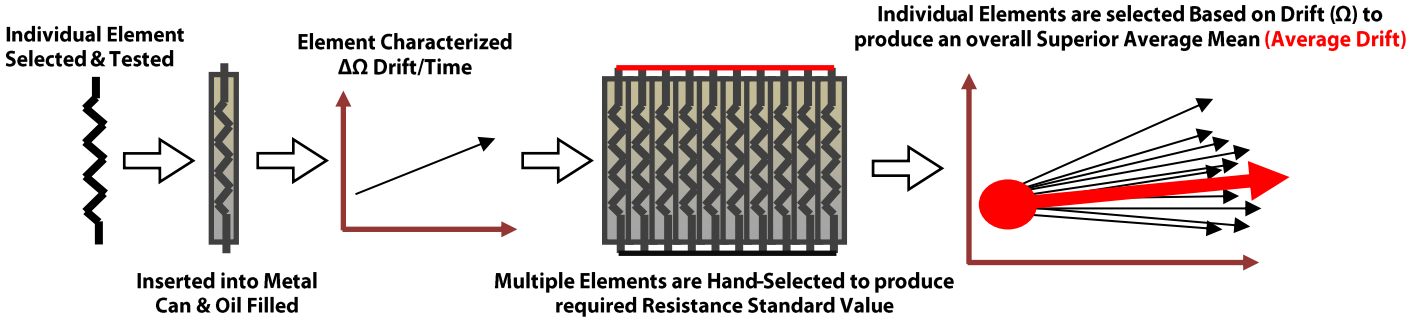
- Normal Ohms Resistance Range: 0.1 Ω to 100 MΩ in Single Decade Increments
- NEW LOW Ohms Resistance Range provides 1 mΩ to 0.1 Ω in Decade Steps
- Temperature Coefficient < ± 0.005 ppm/°C
- Stabilities Low as < 2 ppm/year
- Thermometry Resistance Values Available
- 4-Wire Low Thermal Gold-Plated Connections
- Eliminates Oil Bath Requirements
- Internal PRT Stability: ±0.05 °C / Year
- Custom Internal Temperature Set Points
- Ambient Temperature Range: 23 °C ± 5 °C
- Low Thermal EMF's – Shielded Chamber
- Guarded Resistance Element Chamber
- Custom Values / Models Available
- CE Marked with World-Wide Voltage & Frequencies
- Top End Range Values up to 100 TΩ with Guildline Model 6636

6634A Series of Temperature Stabilized Resistance Standards

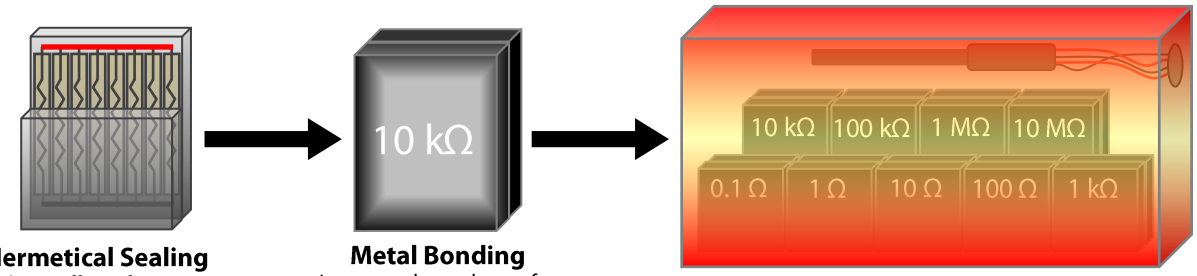
The design of Guildline's 6634A Series Resistance Standards is **based on innovation, knowledge, and manufacturing experience** in building resistance standards **since 1957**. Guildline Standards are the **best by design** and by manufacture.

One **key advantage of Guildline** Resistance Standards is that each Resistance Value is **made up from multiple resistance elements,** not just a single element which is the technique used by most manufacturers. This approach **lowers the drift** that is seen with a single element and **reduces the internal noise** generated inside the reference resistor. Other real advantages are the **use** of a **PRT vs a thermistor** for **internal temperature control**, and the Guildline 6634A Standard **does not require any fans** like competitive models. The result is **industry leading annual drift** rates and **very quiet** measurements.

The **design starts** with every resistance element going through an exacting process that **ensures quality** and long-term stability. This **process is diagrammed** as shown:



After the elements have been characterized, selected and assembled; the elements are then encased and **hermitically sealed**. This **dramatically reduces the affect of humidity and pressure**. Then, to ensure thermal stability, the entire sub-assembly is metal bonded. These elements are built up, electrically isolated, and inserted into a **Temperature Controlled Chamber** as per the following diagrams. The **PRT** is then added to monitor the temperature and provide feedback control for **stability within +/- 0.05 °C**. These design attributes result in **extremely small temperature coefficients** – even in a loosely controlled laboratory environment.



Hermetical Sealing
Reduces affect of Pressure, Humidity & Temperature!

Metal Bonding
Increases thermal mass for Temperature Stability!

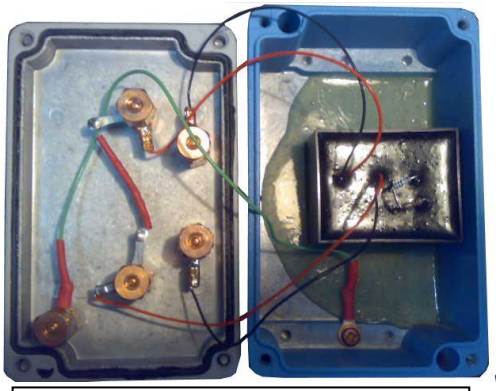
Thermal Chamber Enclosure of Elements and PRT Insertion (9 element shown)

This multi-element design is unique to Guildline Resistance Standards. Other manufactures say they also use a multi-resistor design but their design is actually a single main element (e.g. 10 kΩ) with multiple inexpensive TRIM resistors used to get close to the nominal value. However, they misleading state that they use a multi-resistor design the same as Guildline's! This is a totally different and much cheaper design and the result is a more unstable resistor with poor secondary performance - even though on paper their specifications are stated to match Guildline's. In fact, the **competitions design** is so different, they have to **incorporate a fan on the rear which adds electrical noise and increases thermal EMFs by moving air across the terminals.**

While anyone can state that their design is superior, Guildline feels that pictures are worth thousands of words. On the left is an individual Guildline Resistance Standard. Note that in this design you can see the spacing between the C1 and C2 Terminals showing that multiple elements are used in the MAIN element build up. In fact, the primary (1st) trim resistor used in this Guildline Resistance Standard is what many of our competitors use as their primary resistant element. A picture of a competitive resistance standard is shown to the right. You can see how the wires go from a 4 wire down to a single 2 wire connection where the unit is sealed. This means a single resistor is used as the MAIN element. Also note the cheap resistors used for trimming, and the overall poor build quality. These pictures show that Guildline Standards are designed and built as Primary Standards and will perform for years. In contrast competitive resistance standards are designed to be cheap to build, not for performance.

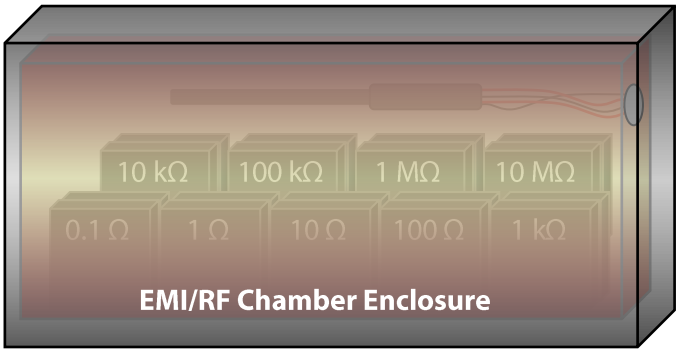


Inside View Guildline



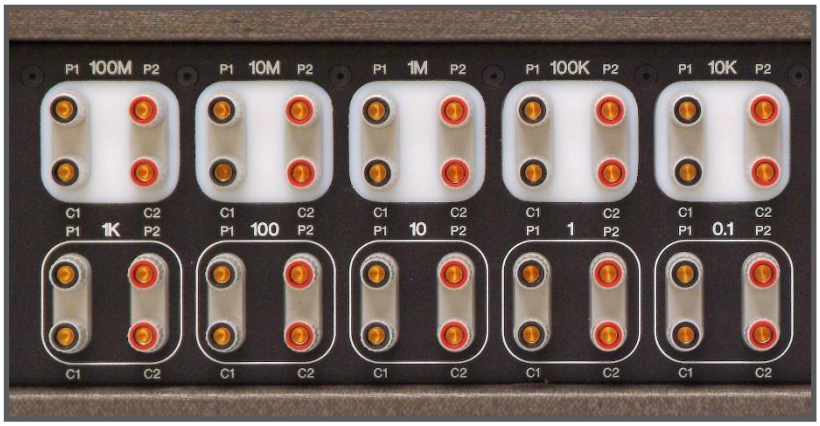
Inside View Competitive Model

Another consideration is Electro-Magnetic Interference **(EMI)** or Radio Frequency **(RF)** impact on the performance of 6634A resistance elements. The entire Temperature (Thermal) Chamber, with all the elements, is placed inside another **EMI/RF Enclosure**. By incorporating an enclosed shielded chamber, coupled along with a **tightly controlled temperature environment**, measurement **uncertainties** can be **significantly controlled and reduced**.



The resistor elements are **securely mounted** to the inside of a **hermetically sealed** aluminum enclosure. As previously stated, the resistance element itself is composed of multi-resistors, and encapsulated in a bonding material selected for its resistance to humidity and barometric pressure.

All Resistance values including Low Ohms models incorporate **5-way beryllium copper, gold plated binding posts** that provide ultra low 4-Wire thermal connections. These are the same connectors found on our **World Leading Direct Current Comparator Bridges**! For values 10 kΩ and higher, a special protective insulator is also used.



The **compact size and wide operating temperature** range of the model 6634A make it perfect for automation. When used with a low thermal scanner such as the Guildline 6664C or an automated DCC Resistance Bridge such as the Guildline 6622A Series, **full automation of resistance measurements to 100 MΩ is provided**.

6634A Series of Temperature Stabilized Resistance Standards

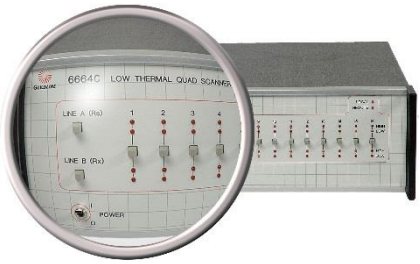
Low Ohms Model - Given the performance of the Model 6634A standard values from 0.1 Ω to 100 MΩ, customers have requested that Guildline provide a 6634A with low value resistance standards - so we obliged. We now have a **Low Ohms model** that has 3 elements from **0.001 Ω to 0.1 Ω**. You can also have any special value (e.g. 5 mΩ), but the unit is limited to 3 elements due to the larger size of the low value elements.

Thermometry Models - A Thermometry Model Series includes **special thermometry values** such as 0.25 Ω, 25 Ω, 10 Ω, 100 Ω, 200 Ω, and 400 Ω (or higher). Many customers have specified models with dual resistance elements (e.g. 2 x 10 Ω, 2 x 25 Ω, 2 x 100 Ω, etc.) as this is especially desirable for **'Self Calibration'** of temperature bridges. In addition, due to the **ultra short-term stability** of the resistance elements, a 6634A can be used to **verify actual ratios** on Temperature Bridges or devices such as Fluke (Hart) Super-Thermometers. By having 2 of each value, you can verify the 1:1 ratios as well as higher and lower ratios! If AC performance is required, check out our **7334 AC/DC Series of Precision Resistance Standards** which can also be delivered in a temperature stabilized and EMI shielded chamber.

For Thermometry, the Guildline **3210 Series of Thermometry Adapters** provides a **low noise, low thermal** contact, high isolation interface switch and connection panel. The 3210 allows multiple PRTs, SPRT's or other **temperature devices** to be **easily connected to measurement** devices such as Guildline's 6622T and 6640T Temperature Bridges and the Model **6634A Temperature Stabilized Resistance Standard**. The 3210 can be connected directly with no need for a scanner. This model has a **built-in switch** to automatically **measure multiple connected devices**, while using individual programmable **pre-heat/keep-warm currents** in between measurements.



Guildline's **6664C Low Thermal, 4-Wire Scanners** are the first commercial scanners capable of operating at **1000 V.** This Scanner has greatly **improved the measurement/calibration** throughput of **6634A Resistance Standards**. With the very low thermal, 4-Wire connections, you can simply connect the 6634A directly to a **6664C-8 or 16 Channel Scanner** to provide a single connection point for **all resistance values** when selected manually via the push-button operation or **automatically via software**. With 4-Wire, 2 A and 1000 V capability, the 6664C is perfect for automating standard resistance measurements.



The 6634A Temperature Stabilized Resistance Standard is the **recommended standard** for **Guildline's 6625A Resistance and Current Measurement Systems**. The 6625A Measurement System provides demanding users the **best in performance** and value. Incorporating some of the most unique instruments and standards, the 6625A Measurement System is the **only true "turn-key" Resistance** and Current Measurement System available today. This System provides the **best in measurement specifications** and the widest range of operation available from any manufacturer and is ideally suited for NMIs, militaries, and calibration labs.



The **6625A Measurement System** is highly configurable to meet wide ranging workload requirements. The 6625A is capable of resistance measurements using **6634A models** from **1 μΩ up to1 GΩ** at 1000 V with a single 6622A DCC Bridge.

The **6625A unique design** and modularity allows customers to purchase what they need today to **support calibration** of their current work-load and be assured of an **upgrade path** to support their **future requirements**. With a **6634A incorporated**, the 6625A System is typically delivered ready for use in a single 'fly-away' rack less than **30 inches (76 cm) in total height**.

6634A Specifications

Nominal Resistance (Ω)	Nominal Initial Tolerance[2] (+/- ppm)	24 Hour Stability (+/- ppm)	12 Month Stability[3] (+/- ppm)	Temperature Coefficient (+/- ppm/°C)	Maximum Voltage (V)
0.001[1]	20	0.4	15	0.04	0.01
0.01[1]	10	0.2	10	0.02	0.03
0.1	10	0.1	4	0.01	0.1
1	10	0.01	2.5	0.005	0.32
10	10	0.01	2.5	0.005	1.0
100	10	0.01	2.5	0.005	3.2
1 k	10	0.01	2.5	0.005	10
10 k	10	0.01	2	0.005	32
100 k	15	0.02	5	0.01	100
1 M	25	0.04	5	0.02	320
10 M	35	0.2	6	0.2	1000
100 M	50	0.5	15	0.2	1000

Note 1: Models containing Low Ohms Values are limited to a maximum of 3 elements.

Note 2: Nominal initial tolerance is defined as the maximum variation of resistance mean values as initially adjusted at the point of sale.

Note 3: Stability is exclusive of the effects of applying power above 20 mW, but not exceeding the maximum voltage, in terms of hysteresis and short-term temperature stabilization.

Calibration Note: 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.

General Specifications

Resistance Range (Low Ω)	0.001 Ω to 0.1 Ω (Maximum of 3 elements). Special Values between 0.001 Ω to 0.1 Ω available at time of order.			
Resistance Range (Normal Ω) ►	0.1 Ω to 100 MΩ. Maximum 10 Elements in one unit. Special values between 0.1 Ω and 100 MΩ available at time of order.			
Temperature Stability ►	± 0.05 °C over 1 year, exclusive of self heating effects of the resistors			
PRT Sensor ►	Temperature Set-point	Stability (1 Year)	Resistance	Scale
	30 °C ±0.5 °C	± 0.05 °C	100 Ω ± 0.1 % at 0 °C	(0-100 °C) 0.392 Ω/°C
Power Requirements ►	VAC: 100, 120, 220, 240 V ± 10 %	Frequency: 50/60 Hz ± 10 %	15 VA Maximum	
Environmental ►	Operating	18 °C to 28 °C, < 50 % RH, non-condensing		
	Storage	-20 °C to 60 °C, < 90 % RH, non-condensing		

Dimensions Rack Mount	Height (Bench Top Adder)		Width		Depth		Weight (Bench Top Adder)	
	132 mm (142 mm)	5.2 in (5.6 in)	440 mm	17.4 in	503 mm	19.8 in	9.4 kg (11 kg)	20.7 lbs (24 lbs)

Set-Point Note. Optional PRT Set-Points of 35 °C and 40 °C are available, however the unit cannot go lower than 30 °C. This is due to the 6634A Design which uses heaters to raise the temperature, but does not include cooling as this creates internal noise. By using a 30 °C temperature, this allows the unit to operate efficiently when placed in either a laboratory environment of 23 °C ± 5 °C or inside an equipment rack, which typically operates at around 28 °C.

6634A Series of Temperature Stabilized Resistance Standards

100 MΩ not high enough? Check out the **6636 Temperature Stabilized** Resistance Standards with high to ultra high **values from 10 MΩ to 100 TΩ**. The 6636 can be configured with up to 6 standard decade resistance values, covering the range of 10 MΩ to 100 TΩ. Each resistance element is isolated and has an N-type terminal connection on the back panel.



(Model 6636 Rear View)

Guildline also provides **world leading Air Resistance Standards** with values from **1 µΩ all the way to 100 GΩ** with our 9334A Series; and from **10 MΩ to 10 PΩ** with the 9336 and 9337 Series.



9334A Series

Guildline is proud to introduce a new series of Precision Air Resistors. The new Model 9333 are some of the best secondary precision standards available today. The design is still based on multi-elements, but we use just use fewer of them and they are priced accordingly.



9333A Series

Need high Current capability in a resistance standard? Check out our **9230A Series of Precision DC Shunts** (Resistors) or our 9211 and 9210 Multi-Tap Shunts (Resistors).

AC Performance a requirement? The **7334 Series of AC/DC Resistance Standards** are designed for AC Temperature Bridges. Need AC Resistance but with high currents and higher frequencies? For best AC Performance to 100 kHz, our **7340 and 7350 AC/DC Shunts** provide stable resistance values for AC currents up to 100 A. **Values, performance and quality** that nobody else can provide!



7340 Series

Each of the Data sheets for these Series and Models can be found on the web at **www.guildline.com**.

Ordering Information

6634A-10	Resistance Standard with 10 Decade Elements 0.1 Ω to 100 MΩ
6634A-9	Resistance Standard with 9 Decade Elements 0.1 Ω to 10 MΩ
6634A-8	Resistance Standard with 8 Decade Elements 1 Ω to 10 MΩ
6634A-7	Resistance Standard with 7 Decade Elements 1 Ω to 1 MΩ
6634A-6	Resistance Standard with 6 Decade Elements 1 Ω to 100 kΩ
6634A-5	Resistance Standard with 5 Decade Elements 1 Ω to 10 kΩ
6634A-LO	Resistance Standard with 3 Decade Elements 0.001 Ω to 0.1 Ω
/TM6634A	Technical Manual (Included)
/ST-X	Optional Internal Temperature Set point (Specify 35 °C or 40 °C)
Note: ISO/IEC 17025 Report of Calibration and Calibration Certificate Included	
/Lead-11	Low Thermal Lead Pair w/Gold Plated Banana Plugs, 1 m length
/Lead-12	Low Thermal Lead Pair w/Gold Plated Banana Plugs, 2 m length
*Other Precision Leads Are Available – Call and tell us your requirements	

Guild*line* is distributed by**:**

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