6540 Dual Measurement High Resistance Bridge

Setting The Standard in High Resistance Bridge Measurement Precision

FEATURES

- Bridge and Direct Measurement Modes
- Ratio Measurements from 1:1 to 100:1
- Resistance Range: 100 kΩ to 20 PΩ
- Test Voltages from 1 V to 1000 V
- Optional Current Measurement: 20 µA to 2 pA
- Automatic Ranging and One-Button Operation
- IEEE-488.2 & RS232C with SCPI Support

Guildline's 6540 delivers the lowest measurement uncertainties with full traceability, outperforming any commercially available high resistance instrument.

With a measurement range from **100 kΩ to 20 PΩ**, the 6540 supports both **Bridge Mode**—using a reference standard and selectable ratios for optimal precision—and **Direct Mode**, enabling absolute resistance measurements without a reference. This dual-mode capability offers unmatched flexibility and performance for metrology labs, calibration facilities, and high-resistance research applications.

The 6540 supports two precision measurement modes: **Bridge Mode** performs ratio comparisons between a known reference resistor and an unknown resistance across selectable ratios from **1:1 to 100:1**. **Direct Mode** enables absolute resistance measurements without a reference standard. The 6540's thermally controlled, low-impedance architecture minimizes loading effects and environmental influences, delivering lower uncertainties. When integrated with the Guildline **6564 Scanner**, the 6540 enables fully automated, high-accuracy resistance measurements and calibrations.

High resistance measurements often have high uncertainties due to environmental factors, EMI, and complex setups. The 6540 overcomes these with dual measurement modes, thermal regulation, and EMI shielding. Its low-impedance design minimizes loading effects, reducing uncertainty and improving accuracy. A temperature-controlled chamber stabilizes internal circuitry, while EMI shielding ensures operator proximity has no impact on measurements.

The 6540 utilizes an internal stable voltage source that only requires an annual verification via an artifact calibration with a single 100 MΩ standard to minimize internal drift. With the use of an annual artifact calibration, a full recalibration is only required once every three years

6540 Dual Measurement High Resistance Bridge

Simplified Operation - Superior Performance

Operate the 6540 manually via the intuitive front panel or remotely using standard communication interfaces. Real-time measurement data—including calculated ratios, resistance values, and statistical analysis—are accessible locally or via SCPI commands. Pair with the Guildline 6564 High Resistance Scanner for fully automated, multi-point measurements with zero operator intervention.

Bridge Measurement Mode

In Bridge mode, the operator simultaneously connects both a reference standard (Rs) and an unknown resistance (Rx) and performs ratio measurements within a range of **1:1 to 100:1**. The 6540 utilizes a single built-in voltage source and the same measurement circuitry to measure both resistors. This design eliminates errors and extra uncertainty contributions associated with using different voltage sources and a separate null detector. The 6540 first measures the reference resistor (Rs), then automatically switches to measure the unknown resistor (Rx). The 6540 internally calculates and displays the resulting value using the simplified equation:

Rxc = (Rxm / Rsm) * Rsc

Where:

Rxm = Measured resistance of the unknown resistor
Rsm = Measured resistance of the reference resistor
Rsc = Known or nominal resistance value of the reference resistor
Rxc = Calculated resistance of the unknown resistor

Direct Measurement Mode

In Direct Measurement Mode, the 6540 provides direct, low uncertainty resistance readings without requiring a reference standard. Simply connect the unknown resistor (Rx) and initiate the measurement. The system automatically performs all necessary calculations and displays the result.
Two 12-month uncertainty specifications are available:

- **Relative Specification** – Allows users to apply their own calibration uncertainties.
- **Absolute Specification** – Includes calibration uncertainty under Guildline's ISO/IEC 17025 accreditation.

Both specifications remain valid across a broad ambient range of environmental variables.

Optional Current Measurement

An optional current measurement is available for the 6540. Providing a wide range from 10 µA down to 2 pA, the 6540 provides some of the best uncertainties for low current measurement available today. The measurement circuitry, like the bridge, is contained within a temperature and EMI chamber. This allows a wide temperature range for the laboratory environment. Specifications for the current option are absolute and include Guildline's traceable uncertainties.

12 Month Absolute Specifications **(± %) 23 °C ± 5 °C**								
Range	20 µA	2 µA	200 nA	20 nA	2 nA	200 pA	20 pA	2 pA
Accuracy	± 0.1 %	± 0.1 %	± 0.2 %	± 0.2 %	± 0.2 %	± 0.2 %	± 5 %	± 20 %

6540 Dual Measurement High Resistance Bridge Specifications

Bridge Mode

Rs	Max Resolution	Voltage Range[2]	12 Month Ratio Uncertainty[3]		
			1:1[4]	10:1	100:1
100 kΩ [1]	0.00001 kΩ	1 V	7	10	30
1 MΩ	0.0000001 MΩ	1 V	7	10	30
10 MΩ	0.000001 MΩ	1 V to 10 V	7	10	30
100 MΩ	0.00001 MΩ	1 V to 100 V	7	10	30
1 GΩ	0.0000001 GΩ	10 V to 1000 V	7	10	30
10 GΩ	0.000001 GΩ	10 V to 1000 V	7	15	50
100 GΩ	0.00001 GΩ	100 V to 1000 V	10	40	100
1 TΩ	0.0000001 TΩ	1000 V	20	120	150
10 TΩ	0.000001 TΩ	1000 V	70	250	
100 TΩ	0.00001 TΩ	1000 V	180		
1 PΩ	0.0000001 PΩ	1000 V	800		
10 PΩ	0.000001 PΩ	1000 V	2000		

1 – 100 kΩ is minimum measurement
2 – Calibrated at decade voltages
3 – Ratios do not include Rs Uncertainty and are specified (± μΩ/Ω) at k=2 (95% CL)
4 – Using Interchange Technique

Direct Measurement Mode

Range[1]	Full Scale	Max Resolution	Voltage Range[2]	12 Month Uncertainty[3]	
				Relative	Absolute
100 kΩ	200 kΩ	0.00001 kΩ	1 V	100	120
1 MΩ	2 MΩ	0.0000001 MΩ	1 V	50	60
10 MΩ	20 MΩ	0.000001 MΩ	1 V to 10 V	50	60
100 MΩ	200 MΩ	0.00001 MΩ	1 V to 100 V	50	60
1 GΩ	2 GΩ	0.0000001 GΩ	1 V to 1000 V	50	60
10 GΩ	20 GΩ	0.000001 GΩ	10 V to 1000 V	100	140
100 GΩ	200 GΩ	0.00001 GΩ	100 V to 1000 V	100	150
1 TΩ	2 TΩ	0.0000001 TΩ	1000 V	500	575
10 TΩ	20 TΩ	0.000001 TΩ	1000 V	1000	1150
100 TΩ	200 TΩ	0.00001 TΩ	1000 V	1500	2000
1 PΩ	2 PΩ	0.0000001 PΩ	1000 V	10000	15000
10 PΩ	20 PΩ	0.000001 PΩ	1000 V	100000	150000

1 - Minimum resistance measurement is 20% of Range for selected range. 100 kΩ is minimum measurement
2 – Calibrated at decade voltages
3 – Uncertainty is specified (± μΩ/Ω) at k=2 (95% CL). Absolute uncertainty includes Guildline Laboratory Environmental parameters and 17025 Accredited Uncertainties

6540 Dual Measurement High Resistance Bridge

Optimize Your 6540: Precision Accessories for Peak Performance

To fully unlock the performance of the 6540 Dual Measurement Bridge, Guildline offers a comprehensive suite of supporting instruments—each engineered to maximize accuracy, efficiency, and flexibility in high resistance metrology.

5032 Programmable Air Bath

5032 Programmable Temperature Air Bath

For laboratories already equipped with numerous high-value resistors, the 5032 Air Bath offers a flexible, user-configurable solution for maintaining temperature stability across multiple devices. Its **1 mK resolution**, dual-fan circulation, and robust **EMI shielding** ensure consistent thermal environments for both DUTs and reference standards. Featuring **IEEE and RS-232 control**, the 5032 supports **automation** and includes a second PRT channel for accurate internal temperature monitoring—**making it perfect for customers who demand both precision and adaptability.**

6636 Temperature Stabilized Resistance Standard

6636 Temperature-Controlled High Resistance Standards

The 6636 provides unmatched thermal stability and EMI shielding, delivering optimal performance when used as the reference standard in Bridge Mode. Its **fixed, temperature-regulated design ensures the resistor value remains stable**, completely eliminating drift from laboratory temperature fluctuations. With its **compact footprint**, the 6636 **preserves valuable bench space**, making it ideal for crowded metrology labs where precision and practicality must coexist.

6564 High Resistance Scanner

The 6564 is pivotal for users managing high-throughput workloads who require seamless automation without compromising measurement integrity. Supporting up to **1000 V** and resistances to **100 TΩ**, the 6564 introduces minimal additional uncertainty—even at the highest ranges.

Factory-configured for direct use with Guildline's TerraCal software, the 6564 offers turnkey integration into automated calibration systems. For users with custom workflows, it also supports flexible automation via standard SCPI commands. With the 6564, a complete calibration range—from 100 kΩ to 100 TΩ—can be executed in a single, unattended session, **significantly boosting lab efficiency and throughput**.

6546 High Resistance Scanner with 8 – 16 Channels

9336 and 9337 Ultra-High Value Precision Standards

Guildline's High Value Resistance Standards are trusted by calibration labs and research institutions for their exceptional stability—drift as low as 10 μΩ/Ω per year. Covering ranges from 10 MΩ to 10 PΩ, they are used for both precision calibrations and the scientific validation of novel concepts in high resistance metrology.

9336 and 9337 Ultra-High Value Precision Standards

6540 Dual Measurement High Resistance Bridge

General Specifications

Voltages	Statistics (Detail and Summary)
1, 2, 5, 10, 20, 50,100, 200, 500, 1000 V_{DC}	Min, Max, Avg, Std Dev, # Samples

Bridge Mode Connectors (Rs/Rx)		Direct Mode Connectors	
Source (+)	Miniature High Voltage MHV (F)	+	Miniature High Voltage MHV (F)
Input (-)	3 lug Triax (F)	-	3 lug Triax (F)

Display Resolution	4 to 8 Digits (Selectable)	Input Impedance	100 kΩ (Bridge & Direct)
Measurement time	5 ms to > 1000 seconds	# User Profiles	36 Programmable

Input Voltage (User Selectable)		Power
50 or 60 Hz (± 5%)	100, 120, 220, 240 VAC (± 10 %)	50 VA

Rear Interfaces			
IEEE 488.2	RS232C	Interlock (Safety)	Ext Trig

Temperature Environment				
Stability	Operating		Storage	
1°C	15 °C to 30 °C	59 °F to 86 °F	-30 °C to 70 °C	-22 °F to 158 °F

Humidity (Non-Condensing)			
Operating	20 % to 50 % RH	Storage	15 % to 80 % RH

Dimensions	(H)	(W)	(L)	Weight		
Metric (mm)	133.4	442	523	Instrument	25 lbs	11.4 kg
US (Inches)	5.25	17.4	20.6	Shipping	40 lbs	18.2 kg

Ordering Information

6540	Dual Measurement High Resistance Bridge with Extended Range 100 kΩ to 20 PΩ
-C	Current Option – Add Current Option to Model
6540 includes 2 Year Warranty and 17025 Accredited Calibration for Direct Mode	

6540 Options (See 6530 Series Options datasheet for more information)

6564 Series	8 or 16 Channel, 1000 Volt High Resistance Scanners
9336/9337	See 9336/9337 Resistance Standards Data Sheet for More Information
6636	See 6636 High Resistance Standards Data Sheet for More Information
65201	Penn Airborne Adapter
65221	Surface/Volume Resistivity Test Fixture
65222	Large Shielded Sample Enclosure
65223	Small Shielded Sample Enclosure
65224	Zero Link
65225	Lead Set
65226	Calibration Kit (Includes 65224 & 9336-100M)

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