6622T Series

Direct Current Comparator (DCC) Thermometry Bridges

Accurate **WIDE RANGE & MODULAR** *DCC Thermometry Bridges*

GUILDLINE INSTRUMENTS 6622T THERMOMETRY BRIDGE Series expands upon the success of our 6622A Series of Resistance Bridges. The 6622T Thermometry Bridge utilizes new concepts for Direct Current Comparator (DCC) Bridges and provides the best uncertainties available today. These unique innovations in 6622T design have brought about this wide range Thermometry Bridge **accommodating SPRT's, PRT's, HTPRT's, RTD's, and thermistors**, over a resistance range of 0.1Ω to 100 kΩ.

The 6622T Thermometry Bridge's measurement range is very **well suited for temperature calibration** and is designed specifically for **thermometry applications**. The use of DCC bridges in thermometry is preferred as they have inherently **better noise immunity** to external electromagnetic and mechanical noise. Measurements are conducted in **true four-terminal mode** so long test leads can be utilized. Since excitation current is DC, reactance introduced by the probe and probe leads does not affect measurement accuracy. **Thermal EMF is eliminated** by periodic polarity reversal that is **programmable by the user**.

The **built-in, extremely stable** current supply permits selection of output currents between 20μA and 150mA to satisfy a **wide range of sensitivity requirements**. Root 2 values can be conveniently chosen from the instrument front panel or via software.

The 6622T Series Provides the Widest Range of Temperature Measurement and Unique Modular Build of Any Commercially Available Temperature Bridge!

The 6622T Thermometry Series has an **extensive internal menu system** to compliment the large display window that addresses temperature requirements without the need for software or manual calculations. The calculation and temperature conversion are done internally via firmware and the results can be **viewed graphically** on the front panel in **resistance ratio, Ω, °C, °F, and K**. The 6622T Series menu provides the ability to utilize the ITS-90 and IPTS-68 **Temperature Scales** and other associated factors.

Complete with BridgeWorks-T software, the 6622T Thermometry Series offers high sophistication with **easy operation for many routine thermometry functions** such as SPRT calibrations to ITS-90 as well as use of SPRT's with standard temperature conversion scales. The built-in control of peripherals such as the Guildline 6664B full matrix scanners as well as temperature enclosures/baths creates a fully integrated and **automated turn key temperature** calibration system.

6622T FEATURES

- Accuracy to 0.025 mK (i.e. best uncertainty at 0.1 ppm)

- Wide Range From 1 mΩ ~100 kΩ supporting even Ruthenium Oxide RTD's in cryogenic applications

- Built in Temperature Conversion for ITS-90, IPTS-68, and IEC-751 PRT's

- Optimized for operation at low dissipation levels and higher speed

- Graphical and Statistical Analysis provided on the Front Panel Display

- Linearity: ± 0.01 ppm of Full Scale

- Resolution: ± 0.001 ppm of Full Scale

- Wide Range of Ratios: 0.1:1 ~ 100:1

- Fully Programmable IEEE 488

- Comes Complete with BridgeWorks™ Data Acquisition Software

- Unique Calibration Support Strategy

- Optional High Accuracy Extension

- Optional High Resistance Range Extension

- Optional Low Resistance Range Extension

- Complete Automated Temperature Measurement Systems Available

- Temperature Stabilized Resistance Standards Available

6622T Series – Design, and Innovation

An easy-to-use, front panel, **menu system** eliminates in-depth operator learning requirements. An **IEEE-488** communication port is standard on all models. The 6622T Thermometry Series Bridges are available as a rack or bench mount model and even have the option of **front or rear terminals**.

See what you have been missing! The On screen graphical display can visually track temperature and the realization of fixed points! The 6622T is the only Thermometry Bridge available with this **on-instrument graphics capability** which greatly simplifies **tracking temperature changes** and facilitates the operation of fixed points.

Every effort has been taken in the 6622T Thermometry Series design to reduce noise and error. **Thermal EMF effects are eliminated** by automatic current reversal. The **unique architecture** of the bridge and a **control algorithm** further removes gain and offset errors in the **nanovolt balance detector** and the **precision toroid**. The end results are shown by **long term accuracy and linearity** without the need for routine, frequent verification tests.

The 6622T Thermometry bridge can be used in either a **fixed or dynamic reversal rate** mode of operation. In fixed reversal rate mode, **automatic current polarity reversal** is programmable from 2 seconds to 27 minutes. Dynamic reversal rate mode is only available in computerized measurement. In dynamic reversal rate mode, the bridge software optimizes the polarity reversal rate. This feature facilitates **tracking a fast changing temperature**.

With **Guildline's 6622T Thermometry Bridge**, customers only have to deploy and support a **ONE-BRIDGE-SOLUTION** to meet their temperature calibration needs, and optionally their **resistance measurement needs**. For customers this means a substantial reduction in staff training. The **flexibility to purchase options** and upgrades for the 6622T Bridge means that new calibration procedures can be implemented inexpensively **without the additional training** and support that is required when new calibration instruments have to be purchased from multiple vendors.
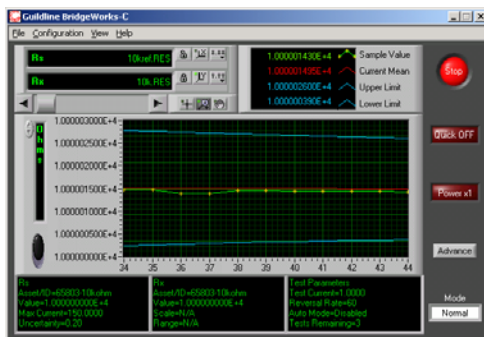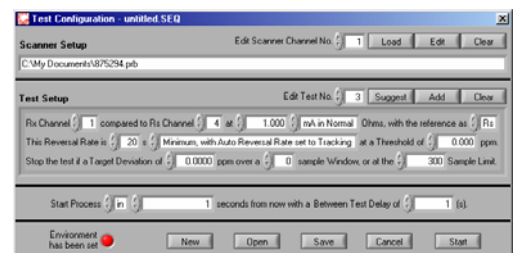

6622T Bridgeworks Software

Not only has Guildline provided unique features in DCC Bridge hardware, but we offer complete new solutions for software as well. The new software program called **Bridgeworks-T**, simplifies setup, control, measurements, and measurement reporting. Bridgeworks-T is **provided at no charge** with each 6622T Thermometry Bridge.

Bridgeworks software is **extremely powerful**, yet **straight forward and user friendly**. The software comes with all useful and convenient features found in commonly used **window based** commercial software programs. **On-line context help** is available to provide added assistance in understanding the functions of the software. BridgeWorks, **developed in LabVIEW©,** offers direct compatibility to all National Instruments GPIB interfaces. These interfaces come in a wide variety of connection options to your PC such as **USB, FireWire, Ethernet, PCI, PCMCIA, RS232/485**, and more. Additional utilities reside within the software to enhance and **simplify the calibration of SPRT's and PRT's.**

When the Bridge is used with a Guildline low **thermal matrix scanner,** the Bridgeworks-T software can turn the bridge into a **multiple-channel** calibration and measurement system. Timed, sequenced or scheduled **single or multiple tests can be initiated** while the bridge is unattended. All user **definable test variables**, such as excitation current, reversal rate etc can be **programmed on a per test basis**, giving the **users full control and flexibility** in conducting well designed experiments. For a **complete, automated temperature** measuring system, a 6622T Series bridge can be used with Guildline's low thermal scanner 6664B, **Guildline's 6634A Temperature Stabilized Resistance Standards** & the 6634TS Temperature Stabilized Traveling Resistance Standard.

Bridgeworks-T Software offers many routine thermometry functions such as SPSRT calibrations to the ITS-90 Scale. The software also provides comprehensive graphic display, math functions and trend analysis. Data can be **easily exported** to MS-Excel®, Crystal Reports® and in HTML format. All reports generated conform to traceability requirements of ISO-17025.

6622T Series Specifications

Note: The 6622T is limited to a maximum of 100 kΩ with maximum Rs (Resistance Standard) of 10 kΩ. This range can be upgraded via standard upgrade modules.

The following table shows the uncertainty contribution of a model 6622T bridge to the total measurement.

Because of the unique variable ratios available, it is possible to measure PRT's with a variety of Rs Standards. For example, a 25.5 Ω SPRT could be measured with a 1 Ω, 10 Ω, 25 Ω or 100 Ω Resistance Standard (Rs). To determine the measurement uncertainty due to the bridge, simply look at the Rs you are using, and go to the appropriate PRT resistance range. For example, the model 6622T bridge has a best uncertainty of 0.1 ppm when the Rs is 1 Ω and the UUT is between 0.8 Ω and 6.3 Ω, that is equivalent to ±25 µK for a 25.5 Ω SPRT at 0 °C measured against a 25 Ω reference resistor, or ±10 µK for a 25.5 Ω SPRT at 0 °C measured using a 10 Ω reference resistor.

Measurement Specifications (12 Month)	6622T Temperature Uncertainty in mK				
	6622T Resistance/Ratio Uncertainty in ppm				
	Rx/Rs Measurement Uncertainty (12-month) with listed Rs				24 Hour Stability
	0.08Ω • Rx • 0.8Ω	0.8Ω • Rx • 6.3Ω	6.3Ω • Rx • 13.4Ω	13.4Ω • Rx • 107.5Ω	
R_S 1 Ω	± 0.075 mK	± 0.025 mK	± 0.025 mK	± 0.025 mK	< ± 0.010 mK
	± 0.3 ppm	± 0.1 ppm	± 0.1 ppm	± 0.1 ppm	< ± 0.04 ppm
	Rx/Rs Measurement Uncertainty (12-month) with listed Rs				24 Hour Stability
	1Ω • Rx • 8Ω	8Ω • Rx • 63Ω	63Ω • Rx • 134Ω	134Ω • Rx • 1075Ω	
R_S 10 Ω	± 0.075 mK	± 0.025 mK	± 0.025 mK	± 0.025 mK	< ± 0.010 mK
	± 0.3 ppm	± 0.1 ppm	± 0.1 ppm	± 0.1 ppm	< ± 0.04 ppm
	Rx/Rs Measurement Uncertainty (12-month) with listed Rs				24 Hour Stability
	2.5Ω • Rx • 20Ω	20Ω • Rx • 157.5Ω	157.5Ω • Rx • 335Ω	335Ω • Rx • 2687Ω	
R_S 25 Ω	± 0.075 mK	± 0.025 mK	± 0.025 mK	± 0.025 mK	< ± 0.010 mK
	± 0.3 ppm	± 0.1 ppm	± 0.1 ppm	± 0.1 ppm	< ± 0.04 ppm
	Rx/Rs Measurement Uncertainty (12-month) with listed Rs				24 Hour Stability
	10Ω • Rx • 80Ω	80Ω • Rx • 630Ω	630Ω • Rx • 1340Ω	1.34kΩ • Rx • 10.75kΩ	
R_S 100 Ω	± 0.075 mK	± 0.025 mK	± 0.025 mK	± 0.050 mK	< ± 0.010 mK
	± 0.3 ppm	± 0.1 ppm	± 0.1 ppm	± 0.2 ppm	< ± 0.04 ppm
	Rx/Rs Measurement Uncertainty (12-month) with listed Rs				24 Hour Stability
	100Ω • Rx • 800Ω	800Ω • Rx • 6.3kΩ	6.3kΩ • Rx • 13.4kΩ	13.4kΩ • Rx • 107.5kΩ	
R_S 1 kΩ	± 0.075 mK	± 0.025 mK	± 0.025 mK	± 0.250 mK	< ± 0.010 mK
	± 0.3 ppm	± 0.1 ppm	± 0.1 ppm	± 1.0 ppm	< ± 0.04 ppm
	Rx/Rs Measurement Uncertainty (12-month) with listed Rs				24 Hour Stability
	1kΩ • Rx • 8kΩ	8kΩ • Rx • 63kΩ	63kΩ • Rx • 134kΩ	Optional Higher Ranges	
R_S 10 kΩ	± 0.075 mK	± 0.025 mK	± 0.075 mK		< ± 0.015 mK
	± 0.3 ppm	± 0.1 ppm	± 0.3 ppm		< ± 0.06 ppm

1 - Specifications are based on 20 second reversal rate, 100 uW R_x power dissipation and temperature of 23°C ±3°C.
2 - Lowest possible R_x is defined as $R_{x(low)} = R_s$ x .08 and Maximum possible R_x is determined by $R_{x(high)} = R_s$ x 107.5.
3 - Maximum Upper Range is limited to 107.5kΩ with the maximum R_s allowed as 10kΩ.

General Specifications

Measurement Range	Resistance/Ratio Display Ω	$10^{-3}\Omega \sim 10^{5}\Omega$ (Available Optional Ranges 1μΩ to 1GΩ)	
	Temperature Display K, ºC, ºF	0K ~ 1343K, -273ºC ~ 1070ºC, -460ºF ~ 1958ºF	
Resistance Ratio Range		0.1:1 ~ 100:1	
Linearity		± 2.5uK or ± 0.01 ppm of full scale ratio (1:1, 10:1 and 100:1)	
Display Resolution		± 0.25uK or ± 0.001 ppm of ratio (	
Temperature Coefficient of Resistance Ratio		0.01 ppm of reading/ºC change in ambient	
Automatic Current Reversal Rate in Seconds (s)		4 s to 1637 s programmable, increment of 1second	
Communication		IEEE-488	
Test current (for measurement to 100 kΩ)	Usable range (A) @ ±30V compliance	20 μA ~ 150 mA	
	Resolution (μA)	2 μA	
	Accuracy [error(ppm) + offset(A)]	±200 ppm ± 10 μA	
Dimensions and Weight		465 mm (D)·440 mm (W)·200 mm (H), 27kg / 18.3" (D) 17.3" (W) 7.9" (H), 59.5 lbs	
Environmental		Operating: 18~28ºC, 20%~50%RH / Storage: −20~60ºC, 15%~80%RH	
Power Requirements		VAC: 100V, 120V, 220V and 240V ± 10% / FREQ: 50 or 60Hz ±5% / 200VA	

Warranty

50 Years of Guildline innovation in engineering and design, solutions that satisfy real measurement issues, and outstanding craftsmanship. How can we improve? Simple! We offer an industry leading **2-Year Warranty** to show you our confidence. All 6622T Thermometry Series Bridges now come with a 2-year Warranty. This warranty covers both parts and labour.

Calibration

Guildline is pleased to announce that our calibration facility is **ISO 17025 Accredited**. We have the widest range of resistance accredited, from **1 μΩ all the way to 10 PΩ**. Whether you own a Guildline product and have other manufacturer's standards, **call today** and see what we can do for you.

Ordering Information

Model	List One Of Following Bench Models*
6622T	Accuracy to 0.025 mK (i.e. best uncertainty at 0.1 ppm)
6622A-09	Rack Mount Kit for 6622T Series Bridge
/RC	Report of Calibration Available at Nominal Charge
/RT	Specifies Rear Terminals versus Front Terminals (Default)
/SM6622T	Service Manual (Extra Charge)
6622T SERIES OPTIONS	
/RES_MEAS	Adds Extended High Range . Specify 100M @ 100V or 1G @ 500V
/3A	Increases Current to 3A, Required for Range Extenders
Bridgeworks-UPG	Upgrades Bridgeworks-T to Bridgeworks-C
/Controller	System Controller with IEEE and Software Integrated
6634A-X	Temperature Stabilized Resistance Standard for 6622T Series
6664B	16 Channel, 2 Amp Low Thermal Scanner
6664A-11	SCW Lead pair with gold plated banana plug, 1m in length
6664A-12	SCW Lead pair with gold plated banana plugs, 2m in length
SCW/18-30	30 Meters Shielded, Copper, Low Thermal Wire 18 Gauge
Many other leads and accessories to include system integration and IEEE are available.	

Guild*line* Instruments

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