Measurements International

Metrology is Our Science, Accuracy is Our Business™

ACCUBRIDGE® 6020T AUTOMATED THERMOMETRY BRIDGE

Two Models Based on Your Needs and Requirements!

Featuring

- Multiple Display Modes Including:
  - Temperature (°C, K,°F)
  - Resistance, Ω
  - Ratio
- ADCC Technology
- Accu-T-Cal™ Software (NMI Designed)

Overview

The **AccuBridge®** 6020T Thermometry Bridge is the metrologist's choice for primary lab level thermometry measurements. With its innovative technology, the 6020T's speed, measurement accuracy, and data handling capabilities make it the preferred primary thermometry measurement system in National Measurement Institutes (NMIs) and other primary labs worldwide. The 6020T was designed for flexibility and ease of use. The 6020T features increased ampere-turn (AT) sensitivity with more turns on both the master and slave windings and a voltage feedback circuit to improve the linearity error of the nanovolt amplifier. Also improved is the ratio from the previous 1.5:1 ratio to the new ratio range covering from 0.1 up to a maximum ratio of 5 allowing customers to meet all of their requirements. MI customers now have unmatched features and functionality to support 6020T's world-class measurement uncertainty capability.

Feature	Benefit
Best accuracy ± 0.015 ppm from 1 Ω to 10 kΩ (equivalent accuracy of 0.004 mK at TPW[1]).	Highest level of accuracy achievable in a commercial DCC bridge.
0.1 Ω to 100 kΩ range.	Widest range providing customers one bridge solution.
6-channel front panel scanner with keep warm currents.	Customers do not need to purchase an additional scanner.
Quick measure mode.	Provides you with the ultimate response time for first measurement, less than 20 seconds.
Current reversal rate as low as 2 seconds.	Gives you world's quickest DC bridge current reversal time of 2 seconds.
Store calibration coefficients for up to 5 thermometers without software aide.	Allows internal memory storage for quick front-panel measurements.

[1] When measuring a 25.5 Ω SPRT, 1 mA current.

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Whether you are certifying fixed-point cells, standard platinum resistance thermometers (SPRTs) or any other resistance temperature device (RTDs) the **AccuBridge®** 6020T Thermometry Bridge (furthermore 6020T) is the metrologist's choice for primary lab level thermometry measurements. With its innovative technology, the 6020T's speed, best available measurement accuracy, and data handling capabilities make it the preferred primary thermometry measurement system in National Measurement Institutes (NMIs) and other primary labs worldwide. The 6020T was designed for flexibility and ease of use. The 6020T features improved ampere-turn (AT) sensitivity with more turns on both the master and slave windings and a voltage feedback circuit to improve on the linearity error of the nanovolt amplifier. The ratio range has also been improved from the previous maximum ratio of 1.5:1 to a new range covering 0.1:1 up to a maximum ratio of 1:14 Rx/Rs and 5:1 Rx/Rs (for the 6020T-Premium) and 14:1 (for the 6020T-Standard) allowing the customer to achieve the maximum accuracy over the entire calibration range using a single reference resistor. Combine this with an exclusive temperature calibration software package developed by NMIs and MI customers now have unmatched features and functionality to support its world-class measurement uncertainty capability.

Quick Measure Mode Provides Customers with the Ability to Have the First Reading Within 20 Seconds from Pressing Start; current reversal rates improved to 2 seconds with measurement sample times as low as 0.1 seconds.

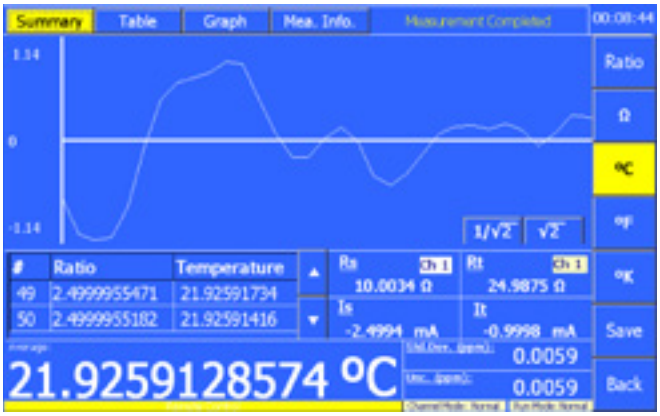
Only MI offers a DC Bridge with these improvements that can meet specifications.

Features

For years, customers have been asking for MI to extend the measurement features of the DC Comparator Bridge to replace existing AC technology. MI has not only answered these requests with the release of the improved 6020T but taken them to the next level.

Ratio Range and Accuracy

The 6020T Direct Current Comparator (DCC) with it's binary wound comparator technology balances current with an effective resolution of 27-bit allowing the 6020T to provide ratio measurements with an accuracy better than 15 ppb (Premium model). This accuracy represents a temperature accuracy better than 0.004 mK (0.000004 °C) at the triple point of water (TPW) when measuring a 25.5 Ω standard platinum resistance thermometer (SPRT), with an accuracy better than 0.016 mK over the range of -189.3442 °C to 660.323 °C (TPAr to FPAI). With the 6020T's expanded range of ratio measurement capability 0.1:1 (or 1:10) to 5:1 (Premium model), a single reference resistor can be used for the entire measurement range.



Measurement Speed

With the new Quick Measure mode, the long wait for measurements to start is over. Now within 20 seconds of pressing Start, the first measurements are available. This is a reduction of the waiting time by more than 60 %.

Next, we focused on current reversal time. Customers want a DC Comparator Bridge that can meet the measurement speed of an AC Bridge. We have accomplished this by improving the current reversal rate to as little as 2 seconds. Combining the Quick Measure mode with improved current reversal rates and measurement intervals, there is no better option for high accuracy data. MI is the only DC Comparator Bridge that has improved these features and still meets stated specifications!

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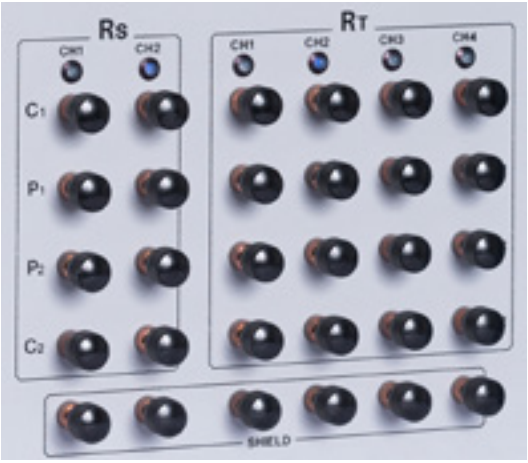
Operation

With a colour touch-screen display, the 6020T is perfectly suited for front panel operation with USB logging for a single measurement cycle. Stand-alone operation via the touch sensitive display panel gives the user full bridge operation capabilities. This includes the ability to store coefficients for up to 5 thermometers allowing the user to seamlessly go from a resistance to a temperature display during measurements. You can also utilize MI's Accu-T-Cal™ application software to fully automated measurements, history logging, graphing and regression analysis. Multiple measurements over time can be displayed in table form or in a graph to best fit your needs.

We at MI understand budget limitations for customers and take that into account when designing new products. That is why the 6020T-Standard and 6020T-Premium models both equipped with a six-channel front panel scanner which incorporates an 1 mA keep warm current, allowing measurements to begin immediately and not have to wait for sensors to equilibrate to the current flowing through them. No other DCC Bridge manufacturer offers both bridge and scanner in one unit!

If more than 6 connections are required 10-, 16- or 20-channel scanners are available to connect up to 40 test resistors or PRT's. Please see the model 4210T and 4220T for options. The 4210T, 4220T series of scanners from MI come standard with the "keep warm" current option.



Overview

The 6020T is designed in two separate models for users' specification requirements or budget. The 6020T is available in two models, Standard and Premium. The Standard version is upgradeable at any time to Premium.

The operation of the 6020T Bridges is simple and easy. You select functions using the menu on the large touch-screen display. For absolute measurements, enter the value and related uncertainty of the standard resistor using the display's keypad. You enter the measurement functions such as current through the PRT under test, settle time, the number of measurements, and the number of statistics the same way. The 6020T's low-noise, touch-screen display is interactive with the measurements. When a reading is complete, the average value and uncertainty (based on the number of statistics) are displayed. All uncertainty calculations are 2σ level. At MI, it's not only about the equipment and science; it's about what you can do and the ease with which you can do it.

MI's 6020T Series Offers Customers a Simple to Use, Cost-Effective Solution that Offers the Very Best Measurement Uncertainties!

Automated Temperature Operation

Measurements International's Accu-T-Cal™ is a software package for the automation of measurements and calibrations of platinum resistance thermometers at primary and secondary level. Accu-T-Cal™ SW is based on over 15 years of experience and research of metrologists from the Laboratory of Metrology and Quality at the Faculty of Electrical Engineering of the University of Ljubljana (UL-FE/LMK).

UL-FE/LMK is the holder of the National Standard for Thermodynamic Temperature in Slovenia.

Accu-T-Cal™ SW has built-in drivers for all Measurements International Temperature and Resistance Bridges as well as the MIL scanners, allowing them to configure multiple PRT's to be calibrated. Communication with all equipment uses the

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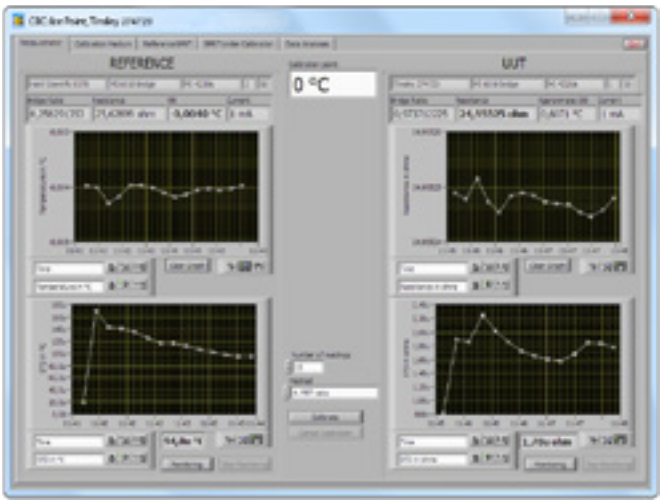
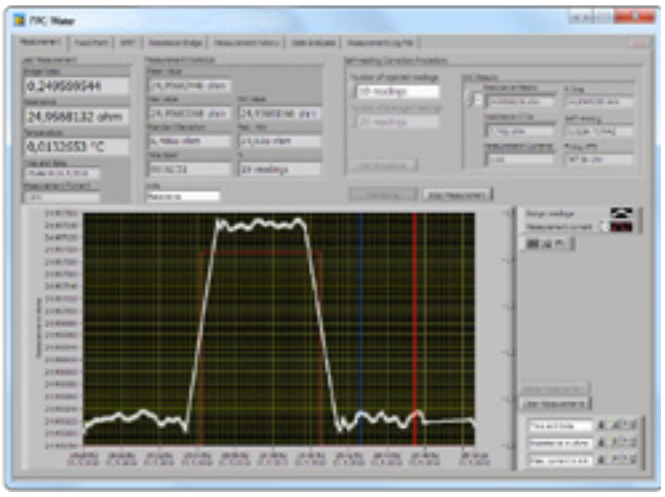
IEEE-488 bus that comes standard with all MIL equipment.

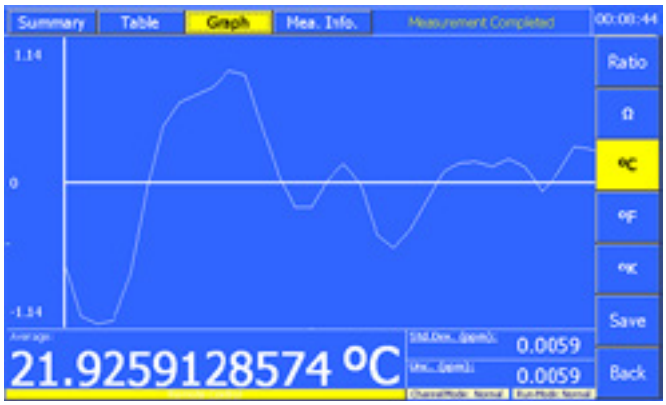
An intuitive user interface allows to configure the hardware, standard PRT's as well as DUT's. The entered parameters are stored for future use or later measurement data analysis.

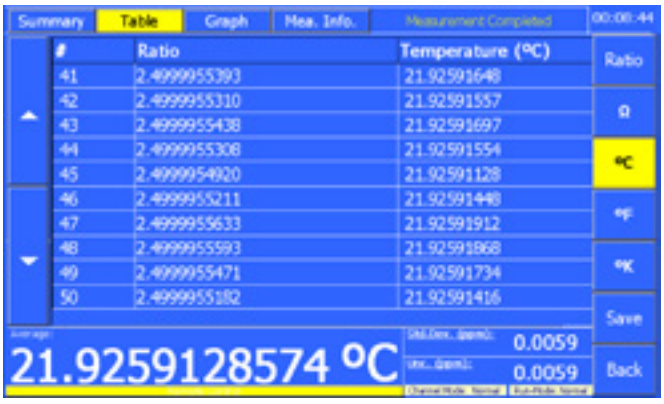
The SW includes a list of the ITS90 fixed-point cell parameters for use when configuring new measurements.

For more information, please visit www.mintl.com and access the Accu-T-Cal™ SW data sheet.









ACCUBRIDGE® 6020T AUTOMATED THERMOMETRY

Specifications: Rev 6

Model	6020T – Premium		
Current Reversal Minimum (s)	2		
Sample Rate Minimum (s)	0.1		
R_S value (Ω)	Accuracy of Ratio* (× 10^{-6})		
	1:1	5:1	1:10
0.1 to < 1	0.015	0.015	0.02
1 to < 10	0.015	0.015	0.02
10 to < 100	0.015	0.015	0.02
1 k to < 10 k	0.015	0.015	0.02
10 k to < 100 k	0.1	0.1	0.2

Model	6020T – Standard	
Current Reversal Minimum (s)	2	
Sample Rate Minimum (s)	0.1	
R_S value (Ω)	Accuracy of Ratio* (× 10^{-6})	
	1:1	14:1
0.1 to < 1	0.07	0.07
1 to < 10	0.07	0.07
10 to < 100	0.07	0.07
1 k to < 10 k	0.07	0.07
10 k to < 100 k	0.15	0.15

*Ratio define as (R_{PRT} / R_S)

Based On a 25.5 Ω SPRT Using a 25 Ω Reference Resistor		
Temperature	Premium	Standard
TPAr	0.001 mK	0.003 mK
TPW	0.004 mK	0.017 mK
FPAl	0.008 mK	0.035 mK

* Optional: Lemo Connectors

Measurement Mode	4-wire
Linearity	< 0.005 ppm of full-scale
Operating Conditions	10 °C to 35 °C, 10 % to 90 % RH non-condensing
Test Current Range	1 µA to 200 mA
Test Current Resolution	18-bit
Interface	IEEE-488
Display	Touch-screen display (no external keyboard), resolution 0.001 ppm

Dimensions (L × W × H):
571 × 483 × 178 (mm)

Weight:
21 kg

Shipping Weight:
30 kg

Mains Power:
100-120V_{AC}, 220-240V_{AC}, 50/60Hz

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