

Precision Thermometer microK

- Ratio Accuracy to $<0.02\text{ppm}$ (20ppb) with Zero Drift
- SPRTs, PRTs, RTDs, Thermistors and Thermocouples
- Reliable 21st Century 100% Solid State Design

The microK family of precision thermometry bridges use a completely new measurement technique to achieve accuracies to better than 0.02ppm.

There are models to suit all levels of temperature metrology from National Measurement Institutes to those wanting a solution to make low uncertainty temperature measurements in a range of applications.

In addition to making the best resistance measurements, the microK makes high accuracy thermocouple measurements with a voltage uncertainty of $<0.25\mu\text{V}$. The microK can be used with all standard thermometer types including SPRTs, Standard Thermocouples, Industrial PRTs and thermistors.

First introduced in 2006 the microK has become the instrument of choice at the world's leading NMIs and many commercial laboratories. All microK models now include IEEE-488 General Purpose Interface Bus as well as RS232 and USB. The microK 70 and microK 125 also feature an Ethernet port and can be monitored and controlled across a LAN.

Performance by Design - Drift Free

"Performance by Design" was the mantra and passion behind the development of the microK. On Day 1 a decision was made, "no tweak pots" (such as used on AC Bridges to correct for flux leakage), no software adjustment, no "self-calibration" but performance by design. The microK achieves its resistance ratio accuracy by design, not adjustment and is uniquely drift free.



Unequalled combination of accuracy, stability and versatility.

To be clear, as a ratio bridge the microK is drift free. This is a benefit of the substitution topology used and provides one of the microK's most exciting features, it is inherently drift free.

It doesn't have compensation or adjustment circuits, it doesn't have software offsets, it doesn't self-calibrate, it never needs adjusting, never needs a service engineer, in ratio measurement it is drift free by design.

For more details read, "Using a Substitution Measurement Topology to Eliminate the Effect of Common Mode Errors in Resistance Measurements used in Temperature Metrology" available on the Isotech Website which also explains why the performance of the microK is superior to DC potentiometric instruments.

Accuracy

Model	Ratio Accuracy	Accuracy (Whole Range)
	ppm*	ppm
microK 70	0.017	0.07
microK 125	0.03	0.125
microK 250	0.06	0.25
microK 500	0.125	0.5

* At Ratio: 0.95 to 1.05

Key Features

- **Resistance Thermometry**
 - 0.1Ω, 0.25Ω, 1Ω, 10Ω, 25.5Ω, 100Ω
 - SPRTs
 - Industrial PRTs
 - Thermistors
- **Voltage Measurement**
 - Laboratory Standards: Platinum / Rhodium, Platinum / Gold and Base Metal, Accuracy to $0.25\mu\text{V}$
- **Display Modes**
 - Numeric and Graphical
 - Ratio, Resistance, Voltage, °C, °F, K
- **Stable**
 - ZERO drift in ratio measurement
- **Three Input Channels**
 - Best Practice Ready
 - Expandable to 92
- **Ease of Use**
 - Intuitive Touch Screen Operation, Store all Standard Thermometer and Standard Resistors internally
 - Log to internal memory or USB Memory Drive
- **Reliable**
 - 21st Century Solid State Design, no moving parts

Performance by Design - More Advantages

In making ratio measurements other benefits by design include:-

■ Zero Hysteresis

There is no hysteresis effect by design

■ Zero Channel to Channel Variation

Even with a microKanner, as the channel expander duplicates the front end of the microK for each input rather than just being a switch box

■ Zero Temperature Coefficient

Temperature Coefficient is 0ppm/°C, another benefit of the substitution technique. No need for warm up or stabilisation periods.

■ Complete Line Frequency Rejection

Total rejection of 50 and 60Hz line frequency

Thermocouple Measurements

When used with an external 0°C cold junction reference unit (or by measuring the junction temperature with a PRT on another channel) the microK can be used for low uncertainty precision thermocouple measurements. The microK is designed for ALL the thermometer types used in a laboratory including Standard Thermocouples. The voltage uncertainty is 0.25µV, equivalent to 0.01°C for a Platinum / Gold thermocouple at 1000°C.

ADC

The microK realises its superior linearity and low noise through a number of novel approaches, including a new noise reduction technique, new solid state switching, new guarding arrangements and a sophisticated substitution topology to achieve zero drift.



National Physical Laboratory

Technology Applied

Keep Warm Currents

The microK includes keep-warm current sources to maintain the power in a PRT when it is not being measured, eliminating uncertainty resulting from power coefficients. Each channel, whether on the microK or a microKanner can be individually programmed.

Zero Current Resistance

The microK was the first Bridge to have the ability to automatically compute and display the zero current resistance with no manual correction, this feature is available on the microK 70 and 125 models.

Low Noise

The new ADC, together with the low noise pre-amplifiers used in the microK, means you achieve a lower measurement uncertainty in a shorter time.

Parallel Processing Technology

The microK 70 and 125 incorporate additional technology (compared to the micro 250 and 500) to deliver superior performance for the Primary Laboratory. A new technique of Analogue Parallel Processing is used to lower noise to a level that previously could only be achieved by the best AC Bridges. These models also feature an Ethernet port

Learn more

Download the
12 page brochure at
www.isotech.co.uk/microk



microK with microKanner

microK GOLD

We are now able to offer a microK with enhanced performance to <30ppb (whole range, 0 to unity) and an unmatched performance promise and warranty...

This unique package is called “microK GOLD”.

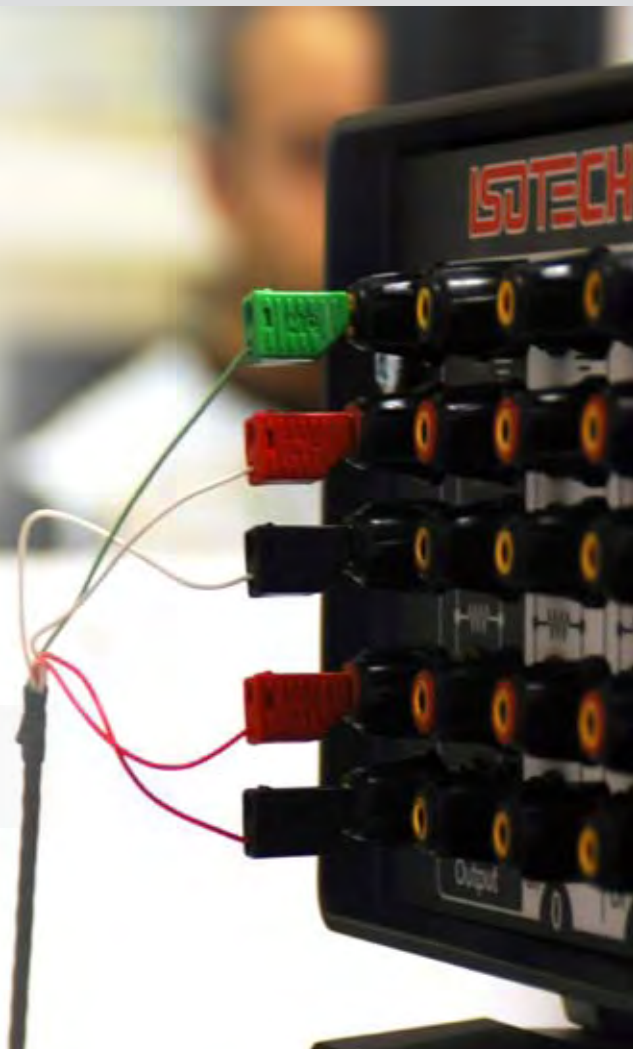
Unique Promise - Performance Guaranteed

We guarantee the 30ppb performance and provide evidence by calibrating the microK with an Automatic Ratio Bridge Calibrator, A-RBC. What is more you can choose to return the bridge for calibration of the ratio accuracy in year two and three with no charge for calibration, you pay only for the carriage.

No other company makes this commitment - we challenge you to find any other company to report ratio accuracy, measured with the RBC and who guarantee that for three years.

Confidence

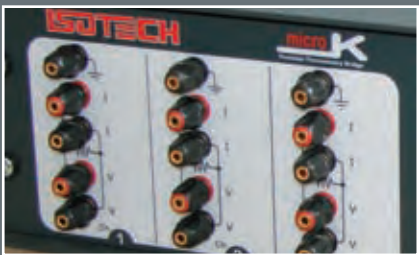
As well as the performance promise we are including an extended three year warranty. Thermometry bridges at this level require a large investment; choose Isotech for the best performance and confidence.



microK Specifications (Specifications are subject to change without prior notice)



Parameter	microK GOLD
Accuracy Whole Range (SPRT $R_o \geq 2.5\Omega$) ^[1]	0.03ppm / 30ppb
Resolution	0.001mK
Resolution Voltage	10nV
Stability	0ppm/yr ^[3]
TC (resistance ratio) ^[4]	0ppm/°C ^[3]
Resistance Range	0 - 100 kΩ
Voltage Range (Thermocouple)	±125mV
Internal Resistance Standards	25, 100, 400Ω
Internal Standard Resistor Stability	TCR <0.05ppm/°C Annual Stability <2ppm/year
Interfaces	RS232, GPIB & USB & Ethernet
Power	25W maximum, 1.5A (RMS) maximum
Weight	13.3kg



microK Universal Specifications

Accuracy - Thermocouples	Voltage uncertainty: Range 0-20mV 250nV. Equivalent to 0.01°C for Gold Platinum thermocouples at 1000 °C	Expandable	Add up to 90 expansion channels
Measurement Time (Per Channel)	Resistance: <2s (1s using the RS232 or GPIB interface) Voltage: <1s (0.5s using the RS232 or GPIB interface)	Probes Supported	PRT's, Thermistors & Thermocouples
Temperature Conversions	PRTs: ITS-90, Callendar-van Dusen. Thermocouples: IEC584-1 1995 (B, E, J, K, N, R, S, T), L and gold-platinum. Thermistors: Steinhart-Hart	Units	Ratio, V, Ω , °C, °F, K
Cable Length	Limited to 10 Ω per core and 10nF shunt capacitance (equivalent to 100m of RG58 coaxial cable)	Switching Technology	Solid state
Input Connectors	Cable Pod™ connector accepting: 4mm plugs, spades or bare wires Contact material: gold plated tellurium copper	Sensor Current	0 – 10mA in 3 Ranges 0 – 0.1mA \pm 0.4% Value \pm 70nA (Resolution 28 nA) 0.1 – 1mA \pm 0.4% Value \pm 0.7 μ A (Resolution 280nA) 1– 10mA \pm 0.4% Value \pm 7 μ A (Resolution 2.8 μ A)
Interfaces	RS232 (9600 baud), USB (1.1) - host, IEEE-488 GPIB	Keep Warm Current	Adjustable 0-10mA Each Channel Adjustable 0-10mA \pm 0.4% Value \pm 7 μ A (Resolution 2.8 μ A)
Ratio Range	Unlimited	Internal Data Storage	2Gb: For > 4 years storage (Timed Stamped Measurements)
Display	163mm / 6.4" VGA (640 x 480) Colour TFT LCD	Operating Conditions	For Full Specification: 15 - 30°C 10 - 80% RH Operational: 0 - 40°C 0 - 95% RH
Channels	3	Supply	88-264 Vac, 47-63Hz
Cold Junction Mode	External and Remote with PRT	Size W x D x H	520mm x 166mm x 300mm / 20.5" x 6.6" x 11.9" (19" Rack Mountable)

microK Specifications (Specifications are subject to change without prior notice)



Parameter	microK 70	microK 125	microK 250	microK 500
Accuracy Whole Range (SPRT Ro \geq 2.5 Ω) ^[1]	0.07ppm	0.125ppm	0.25ppm	0.5ppm
Accuracy Ratio 0.95 to 1.05 ^[2]	0.017ppm	0.03ppm	0.06ppm	0.125ppm
Equivalent Temperature Accuracy ^[2]	0.017mK	0.03mK	0.06mK	0.125mK
Resolution	0.001mK	0.001mK	0.01mK	0.01mK
Resolution Voltage	10nV	10nV	10nV	10nV
Stability	0ppm/yr ^[3]	0ppm/yr ^[3]	0ppm/yr ^[3]	0ppm/yr ^[3]
TC (resistance ratio) ^[4]	0ppm/°C ^[3]	0ppm/°C ^[3]	0ppm/°C ^[3]	0ppm/°C ^[3]
Resistance Range	0 - 100 k Ω	0 - 100 k Ω	0 - 500 k Ω	0 - 500 k Ω
Voltage Range (Thermocouple)	\pm 125mV	\pm 125mV	\pm 125mV	\pm 125mV
Internal Resistance Standards	25, 100, 400 Ω	25, 100, 400 Ω	1, 10, 25, 100, 400 Ω	1, 10, 25, 100, 400 Ω
Internal Standard Resistor Stability	TCR <0.05ppm/°C Annual Stability <2ppm/year		1, 10 Ω <0.6ppm/°C <5ppm/year 25,100,400 <0.3ppm/°C <5ppm/year	
Interfaces	RS232, GPIB & USB & Ethernet		RS232, GPIB, USB	
Power	25W maximum, 1.5A (RMS) maximum		20W maximum, 1.5A (RMS) maximum	
Weight	13.3kg	13.3kg	12.4kg	12.4kg

- Notes:**
1. Over whole range of SPRT, -200°C to 962°C. For Ro=0.25 Ω increased by a factor of 2.5
 2. E.g.: 25 Ω SPRT with 25 Ω standard resistor at water triple point or with direct comparison of similar SPRTs.
 3. The microK uses a "substitution technique" in which the Device-Under-Test and the Reference are successively switched into the same position in the measuring circuit. This means that the stability of resistance ratio measurements is immeasurably small.
 4. Using external reference resistors.