

microK

PRECISION THERMOMETER



**UNEQUALLED COMBINATION
OF ACCURACY, STABILITY
AND VERSATILITY**

We are proud to introduce a new type of precision thermometer, which sets new world standards for accuracy and stability. Designed for a wide range of highly accurate industrial and scientific calibration applications, the instrument uses a completely new measurement technique to achieve accuracies better than 0.4 parts per million (ppm) - equivalent to 0.0004°C - when used with a standard platinum resistance thermometer (SPRT).

The **microK** is believed to be the only instrument of its type in the world which will work to this precision with all three commonly used sensors, platinum resistance thermometers (PRTs), thermocouples and thermistors. In terms of long term stability, microK achieves literally zero drift for resistance ratio measurements and an annual drift of only 3 ppm for voltage measurements. While utilising sophisticated software and specially developed circuitry, the microK is easy to use and has a comprehensive range of built-in features. It utilises a 6.4-inch VGA colour touch screen as the main user interface, providing a number of graphically presented user options and controls. The underlying operating system is Microsoft Windows CE™ facilitating direct reading of temperature for all sensor types, data logging, export of data into Microsoft Excel™ applications and graphing facilities.



Key Features...

- Accuracy ±0.4ppm
- Zero drift for PRTs
- PRT, thermocouple and thermistor sensing
- <2 second measurement time
- Keep-warm currents
- 0-10mA sense source
- Touch screen

Accurate: The microK range of precision thermometers employ a completely new type of sigma-delta ADC to provide measurement uncertainty that is quite simply the best in its class (0.4ppm for µK-400 or 0.8ppm for µK-800).

Stable: The inherently stable 'substitution technique' used in the microK means that it achieves zero drift for resistance measurements and only 3ppm/year for voltage measurements so you can be confident in your measurements between calibrations.

Versatile: This is the only instrument of its type that works with PRTs, thermocouples and thermistors, so you only need to purchase one product for your thermometry application rather than two or more instruments.

Easy to Use: The microK includes a comprehensive range of features, including direct reading in temperature for all sensor types, data logging, easy export of data to Excel™ and graphing facilities. Despite its sophistication the microK is very easy to use. The built in 6.4" full VGA colour touch screen, powered by the Window CE operating system provides a familiar and powerful operator interface so you can get on with making measurements rather than learning how to control the instrument.

Best Practice Ready: Best practice guidelines recommend the use of two reference thermometers for calibrations. That is why we have included three channels in the microK, enabling you achieve best practice without having to buy additional and costly multiplexers.

Reliable: Until now, instruments in this class had to use relay switching. The microK breaks that mould by using the latest semiconductor devices to provide a completely solid state solution. In addition the use of high density silicon integration technology (FPGAs) reduces component count and gives you the highest possible reliability.

Cable Pod™ Connector System: The connectors accept 4mm plugs, spades or bare wires. The 3/4" separation is compatible with standard 4mm to BNC adaptors, so you can use thermometers with any normal termination type. The Cable Pod connector system uses gold-plated tellurium-copper to give the lowest possible thermal EMF and the best measurement uncertainty. The connectors have a clamping arrangement that does not rotate as the terminal is screwed down, thereby protecting the wires from mechanical damage.

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

Keep-Warm Current: 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.

Specifications

Ranges	Resistance Thermometers 0 to 500k Thermocouples ±125mV	Cable Length	Limited to 10 per core or 10nF shunt capacitance (equivalent to 100m of RG58 coaxial cable)
Accuracy - PRTs	k400: 0.4ppm maximum over whole range for SPRT with R0 = 2.5 (equivalent to 0.1mK at 0°C, or 0.4mK over full range) 1ppm maximum over whole range for SPRT with R0=0.25 k800: 0.8ppm maximum over whole range for SPRT with R0 = 2.5 (equivalent to 0.2mK at 0°C, or 0.8mK over full range) 2ppm maximum over whole range for SPRT with R0=0.25	Internal Standard Resistors	1 ±0.1% TCR = ±10ppm/° typical, stability = ±25ppm / year 10 ±0.1% TCR = ±0.6ppm/° typical, stability = ±5ppm / year 25, 100, 400 ±0.1% TCR = ±0.3ppm/° typical, stability = ±5ppm / year
Accuracy - Thermocouples	Voltage uncertainty: 250nV at 20mV (equivalent to 0.01°C for Gold-Platinum thermocouples at 1000°C)	Input Connectors	"Cable Pod" connector accepting: 4mm plugs, spades or bare wires Contact material: gold plated tellurium copper
Resolution	Resistance: 0.01ppm of range Stability: 10nV (125mV range)	Interfaces	RS232 (9600 baud) USB (1.1) - host
Stability	Resistance (excluding resistance standard): 0 ⁿⁱ Voltage: 3ppm / year	Display	163mm / 6.4" VGA (640 x 480) Colour TFT LCD
Measurement Time	< 2 seconds	Operating Conditions	15-30°C / 50-85°F, 10-90% RH (for full specification) 0-50°C / 32-120°F, 0-99% RH (operational)
Temperature Conversions	PRTs: ITS-90, Callendar-van Dusen Thermocouples: IEC584-1 1995 (B, E, J, N, R, S, T), L and gold-platinum Thermistors: Steinhart-Hart	Power	88-264V (RMS), 47-63Hz (Universal) 20W maximum, 1.5A (RMS) maximum
Sensor Current	0-10mA in 3 ranges: 0.1mA ±0.4% of value, ±70nA, resolution 28nA 1mA ±0.4% of value, 0.7 A, resolution 280nA 10mA ±0.4% of value, ±7 A, resolution 2.8 A	Size	520mm x 166mm x 300mm 20.5" x 6.6" x 11.9" (W x D x H)
Keep Warm Current	0-10mA ±0.4% of value, ±7 A, resolution 2.8 A	Weight	12.4kg / 27lb

Specifications are subject to change without prior notice.

A key to achieving such high accuracies and stability is the use of a specially designed analogue to digital converter (ADC) within the instrument's measurement circuits. In conjunction with a digital signal processor (DSP), this uses a unique adaptation of existing advanced sigma-delta ADC techniques to achieve linearity better than 0.4 ppm.

A further major benefit of this ADC technique is its low noise performance, noise is reduced by a factor of 32 over conventional sigma-delta ADC circuits.

A further break with convention is that the instrument uses no mechanical switches, relays or potentiometers whatsoever (other than the main power on/off switch), relying on solid state switching to route voltage and current signals internally. Comparative instruments in this class have used high quality mechanical relays for this purpose, a technique which inherently introduces inaccuracies arising from thermal EMFs, and degrades reliability. By using the latest semiconductor technology, performance has been enhanced, component counts have been reduced and reliability considerably improved.

When measuring the voltage from a thermocouple, it is common practice to reverse the input terminations and repeat the measurement in order to detect and/or compensate for any thermal EMFs. The microK automatically reverses the input connections immediately behind the input terminals with solid state switching. This does not suffer from the limitations (extra thermal EMFs) associated with doing this using mechanical relays. The user can, of course, still reverse the connections manually to gain confidence in the instrument, but it is no longer necessary in order to achieve low measurement uncertainty.

The microK range consists of two instruments, offering a choice of measurement accuracy:

The **microK 400** is accurate to 0.4 ppm and the **microK 800** is accurate to 0.8 ppm. For SPRT's with $R_0 = 2.5$ this is equivalent to 0.4mK (0.0004°C) and 0.8mK (0.0008°C) over the whole temperature range. With thermocouple sensors the voltage uncertainty is 0.25 μ V, equivalent to 0.01°C for Gold / Platinum thermocouples.

The two instruments in the microK range offer performance characteristics and features which are simply not available elsewhere. Comparable instruments available internationally do not achieve the same accuracy or stability (zero drift characteristics with SPRT measurements are not obtainable in any other instrument), do not support the same variety of sensors, and offer considerably less operational features. As a result, the 'Cost of Ownership', a key feature of growing international importance, has been considerably reduced.

Parameter	microK 400	microK 800	Units
Accuracy (25 SPRT)	0.4	0.8	ppm
Accuracy (0.25 SPRT)	1	2	ppm
Probes Supported	PRT'S, Thermistors & Thermocouples	PRT'S, Thermistors & Thermocouples	
Channels	3	3	
Resolution	0.01	0.01	mK
Stability	0 ^[1]	0 ^[1]	ppm/yr
TC (resistance ratio) ^[2]	0 ^[1]	0 ^[1]	ppm/°C
Resistance Range	0 - 500	0 - 500	k
Keep-Warm Current	Yes	Yes	
Internal Resistance Standards	1, 10, 25, 100, 400	1, 10, 25, 100, 400	
Measurement Time	< 2	< 2	s
Units	Ratio, V, μ , °C, °F, K	Ratio, V, μ , °C, °F, K	
Switching Technology	Solid-state	Solid-state	

Notes:

[1] 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.

[2] Using external reference resistors.

For more information visit:

<http://www.microk.co.uk>



Ease of Use

The claim "Ease of Use" is a common one but again the microK breaks the mould. The instrument is operated by a large 6.4" (163mm) colour touch screen. Simply tab through the four user screens to configure the instrument with all the options clearly presented. Temperature conversion types include ITS-90, Callendar-van Dusen, Steinhart-Hart and IEC 584-1. Enter coefficients from the touch screen or add a mouse or full size keyboard via the USB interface. The microK includes a graphing facility with auto or configurable scales. It can also log the data to its internal memory or plug in a USB Pen Drive and log directly to that.

There Is So Much More

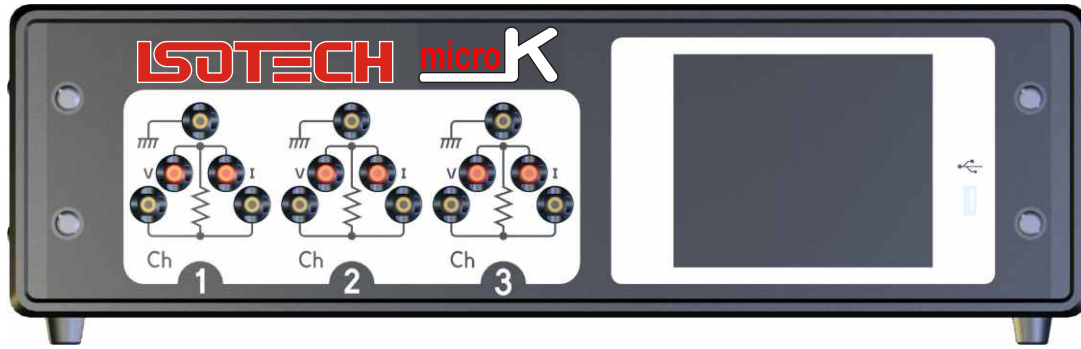
It doesn't stop there, microK has comprehensive security, an internal data base for all the standards and thermometers and it will warn you if a calibration has passed its expiry date. It can automatically be updated by downloading the latest software via the internet. It is fast with a measurement time of less than two seconds and it uses keep warm currents.

contactus

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microK 400

microK 800



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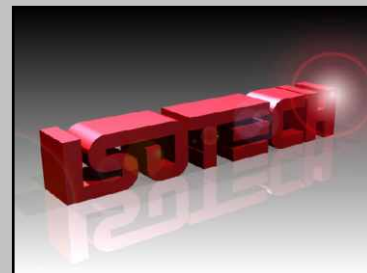
OTHER PRODUCTS:

Isothermal Technology Limited can supply Indicators, thermocouples and Platinum Thermometers for your most exacting needs and we offer the widest range of calibration equipment in the world. We also offer training courses and have technical articles to help you. A visit to our web-site is well worth while. If in doubt why not phone us.



Reliability

Before the microK, instruments with this level of performance had to use mechanical relays. The microK breaks the mould by using the latest semiconductor devices to provide a completely solid state solution. If you have ever seen inside another instrument in this performance class you may have been concerned about long term reliability and servicing cost. Compare this with the inside of the microK.



Isotech is always willing to give technical advice and assistance where appropriate. This publication is for information only. Due to a program of continual development and improvement we reserve the right to amend or alter characteristics without prior notice.

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