GUIDE

TTI-22

Isotech

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ISOTECH

The Source for Calibration Professionals

Selection Guide

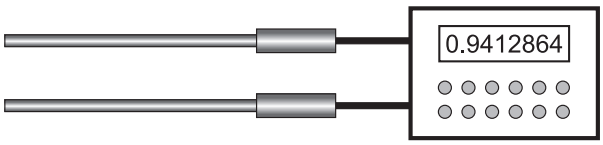
Thermometry Bridges & Precision Thermometers

How to Select a Thermometry Bridge

Use this guide to avoid make costly mistakes when selecting a thermometry bridge

In order to make the best measurements laboratories use Thermometry Bridges to take ratio readings. In a secondary calibration laboratory for best practise a thermometer being calibrated is compared directly to a calibrated Standard Platinum Resistance Thermometer. In a primary laboratory the SPRT is compared to a temperature controlled Standard Resistor.

Different vendors of thermometry bridges will all agree that, for best measurements, you use a ratio method. Whilst older bridges can only display ratio with long lines of digits newer bridges can display both ratio andcompute temperature values from the ratio value.



It can be confusing to compare specifications between different manufacturers, especially between different types of bridges.

When Isotech launched the microK we took the view to give a transparent and conservative figure by specifying the accuracy with a single value to include all uncertainty sources, the key two being linearity and noise. For the four microK models this accuracy figure ranges from 0.017 to 0.5ppm

Every independent evaluation figure that we have seen has confirmed the microK performs better than we claim.

What does this figure mean?

Quite simply with a microK 70 you can expect an accuracy <0.07ppm over the whole measuring range of the SPRT. At a ratio range close to unity, e.g. a 25.5Ohm SPRT at the water triple point with a 25 Ohm Standard, the accuracy is four times better, 0.017ppm or 0.017mK, 17μK.

Accuracy

Model	Ratio Accuracy ppm*	Accuracy (Whole Range) 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

What Does a Laboratory Need?

Of course this depends on the laboratory and should be assessed by the laboratory manager. In general though it has been our experience that most laboratories are looking to upgrade and make measurements with smaller uncertainties. One older design of AC Bridge that has been popular in the past claims a performance of 0.1ppm and this is widely seen as a bench mark figure.

The microK 70 easily exceeds this benchmark and brings extra benefits as explained elsewhere including lower cost, great reliability, ease of use, zero drift, USB Interface, expandability…

http://www.isotech.co.uk

Why choose the microK?

■ Zero Drift in Ratio Measurement

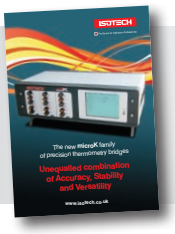
The microK is drift free in ratio measurement, having no "tweak pots" such as on AC Bridges to correct for flux leakage. No offsets in software or "self calibration" it is inherently drift free. For more details ask for the paper "Using a Substitution Topology to Eliminate the Effect of Common Model Errors in Resistance Measurement", or download form our website.

■ Thermocouple Measurements

The microK family can all measure voltage as well as resistance and resistance ratio, so the microK can be used with thermocouples in addition to resistance thermometers, to an accuracy of 0.25μV.

■ Low Noise

The microK uses a new type of ADC, licensed from theNational Physical Laboratory (NPL), which combined with low noise amplifiers means that a lower measurement uncertainty is achievedin a shorter time; see "Noise Performance of the microK" on the web.



More Data at:

http://www.isotech.co.uk/microk

How to Select a Precision Thermometer

For applications where accuracies of <1ppm are not required Isotech Precision Thermometers can be used; the milliK has performance to 5ppm, 0.005°Cover range for a PRT.

■ A Guide to Thermometer Selection

Like thermometry bridges the best thermometers use a technique to eliminate thermal EMFs. Thermal EMFs are generated as the result of dissimilar metals and temperature gradients.

Simple thermometers with a fixed polarity DC measuring current cannot eliminate thermal EMF errors, at high temperatures with industrial PRTs the error can be in the range 0.3 - 1°C or even greater.

Why Choose the milliK?

■ Eliminates Thermal EMF Errors

The milliK uses fast current reversal technology and solid state switching to eliminate thermal EMFs avoiding the errors that occur with fixed DC instruments.

■ Wide Sensor Choice and High Accuracy

Whether measuring temperature, or calibrating sensors the milliK can support SPRTs, PRTs, Thermocouples, Thermistors and 4 - 20mA transmitters - all to high accuracy, to 0.003°C for a PRT at 0°C.

■ Expandable

The milliK can be expanded with up to 32 expansion channels, the millisKanner has 8 inputs, each configurable for SPRT, PRT, Thermistor or Thermocouple with no loss of accuracy.

■ Logging

The milliK can store 180 Days of data internally, or a lifetime of data to a USB Drive.

Precision Thermometer Check List

- ✓ ***Eliminate Thermal EMFs***
- ✓ ***Support all Thermometer Types***
- ✓ ***PRT, Thermocouple, Thermistor and 4 - 20mA***
- ✓ ***High Accuracy, 3mK at 0°C***
- ✓ ***Data Logging to USB***
- ✓ ***Isolated Sensor Inputs***

Isotech Thermometry Bridge Selection Guide

microK

- Resistance and Voltage
- ITS-90 Fixed Point Calibration
- Comparison Calibration of Standards
- High Accuracy Measurement

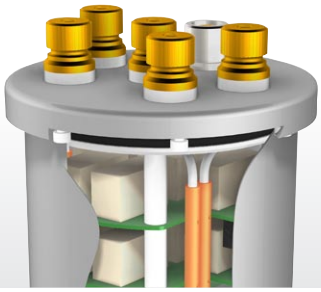
Unequalled Combination of Accuracy, Stability and Versatility

milliK

- High Accuracy
- Eliminates Thermal EMF Errors
- Expandable

High Accuracy - SPRTs, PRTRs, Thermistors Thermocouples and 4 - 20mA

Resistance Bridge Calibrator



- Solution for AC and DC Bridges
- Automatic and Manual Models
- Software for Full Analysis and Reporting

Solve the problem of how to calibrate a Thermometry Bridge

For more information and full specifications: **www.isotech.co.uk**

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