Isotech have a range of innovative precision thermometers to match the calibration requirements of all labs, from most demanding of National Metrology Institutes through to the needs of those calibrating industrial sensors.

**Precision Thermometry Bridges**

The microK instruments and the matching microK channel expander can be used with the best of Standard Platinum Resistance Thermometers, Thermistors and Thermocouples with uncertainties of better than 0.0001°C.

The microK family has unrivalled convenience and flexibility with performance that was previously only attainable with the best of the AC Resistance Bridges.

**Precision Thermometers**

This range includes two high accuracy bench top thermometers. The TTI-22 offer performance to 1mK at a ground breaking new price. The milliK can be used with SPRTs, PRTs, Thermistors, Thermocouples and Current Transmitters.

<table>
<thead>
<tr>
<th>Selection Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
</tr>
<tr>
<td>Precision Thermometry Bridges</td>
</tr>
<tr>
<td>microK 70</td>
</tr>
<tr>
<td>microK 125</td>
</tr>
<tr>
<td>microK 250</td>
</tr>
<tr>
<td>microK 500</td>
</tr>
<tr>
<td>Precision Thermometers</td>
</tr>
<tr>
<td>milliK</td>
</tr>
<tr>
<td>TTI-22</td>
</tr>
<tr>
<td>Scanners</td>
</tr>
<tr>
<td>microsKanner</td>
</tr>
<tr>
<td>Model 954</td>
</tr>
<tr>
<td>Model 958</td>
</tr>
</tbody>
</table>
Resistors
To enable the smallest of measurements Standard Resistors are used, and in the Primary Lab these resistors require to be kept at a precise and constant temperature. Isotech can supply and calibrate Standard Resistors to uncertainties less than 0.08ppm.

Resistor Selection Guide

<table>
<thead>
<tr>
<th>Model</th>
<th>Values</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRA &amp; SRB</td>
<td>SRA: 1, 10, 25 and 100 Ohm 400 Ohm to special order SRB: 1000 and 10,000 Ohms</td>
<td>Primary and Secondary Lab microK</td>
</tr>
<tr>
<td>456</td>
<td>10, 25, 100, 1000, 10,000 Ohm</td>
<td>Affordable Resistors with inbuilt temperature control</td>
</tr>
<tr>
<td>455</td>
<td></td>
<td>Precisely Maintains SRA Primary Resistors at Fixed Temperature</td>
</tr>
</tbody>
</table>

RBC: Resistance Bridge Calibrator
The RBC is designed for quick and simple, in-house calibrations of AC and DC thermometry bridges, with an accuracy of better than 0.1 ppm at 100 Ω. The calibrators are supported by software for analysis of the results.
Precision Thermometer
microK

-200°C to 1800°C

- Ratio Accuracy to <0.02ppm (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 four 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 <0.25µV. The microK can be used with all standard thermometer types including SPRTs, Standard Thermocouples, Industrial PRTs and thermistors.

First introduced in 2006 the microK is rapidly becoming the instrument of choice at the world’s leading NMIIs 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.

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Ratio Accuracy</th>
<th>Accuracy (Whole Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ppm*</td>
<td>ppm</td>
</tr>
<tr>
<td>microK 70</td>
<td>0.017</td>
<td>0.07</td>
</tr>
<tr>
<td>microK 125</td>
<td>0.03</td>
<td>0.125</td>
</tr>
<tr>
<td>microK 250</td>
<td>0.06</td>
<td>0.25</td>
</tr>
<tr>
<td>microK 500</td>
<td>0.125</td>
<td>0.5</td>
</tr>
</tbody>
</table>

* 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 0.25µV

- **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 microsKanner, 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.

**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 microsKanner 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.
Accuracy - Thermocouples

- Thermocouples: Range 0-20mV, equivalent to 0.01°C for Gold Platinum thermocouples at 1000 °C
- Thermistors: Steinhart-Hart
- PRT s: ITS-90, Callendar-van Dusen

Measurement Time (Per Channel)

- Resistance: <2s (1s using the RS232 or GPIB interface)
- Voltage: <1s (0.5s using the RS232 or GPIB interface)

Temperature Conversions

- Thermistors: Steinhart-Hart

Cable Length

- Limited to 10Ω per core and 10nF shunt capacitance (equivalent to 100m of RG58 coaxial cable)

Input Connectors

- Cable Pod™ connector accepting: 4mm plugs, spades or bare wires
- Contact material: gold plated tellurium copper

Interfaces

- RS232 (9600 baud), USB (1.1) - host, IEEE-488 GPIB

Ratio Range

- Unlimited

Display

- 163mm / 6.4” VGA (640 x 480) Colour TFT LCD

Channels

- 3

Cold Junction Mode

- External and Remote with PRT

Expandable

- Add up to 90 expansion channels

Probes Supported

- PRT’s, Thermistors & Thermocouples

Units

- Ratio, V, °C, °F, K

Switching Technology

- Solid state

Sensor Current

- 0 – 10mA in 3 Ranges
- 0 – 0.1mA ±0.4% Value ±70nA (Resolution 28 nA)
- 0.1 – 1mA ±0.4% Value ±0.7µA (Resolution 280nA)
- 1 – 10mA ±0.4% Value ±7µA (Resolution 2.8 µA)

Keep Warm Current

- Adjustable 0-10mA Each Channel Adjustable
- 0-10mA ±0.4% Value ±7µA (Resolution 2.8 µA)

Internal Data Storage

- 2Gb: For > 4 years storage (Timed Stamped Measurements)

Operating Conditions

- For Full Specification:
  - 15 - 30°C   10 - 80% RH
  - 0 - 40°C    0 - 95% RH

Supply

- 88-264 Vac, 47-63Hz
- 13.3kg

Size W x D x H

- 520mm x 166mm x 300mm / 20.5" x 6.6" x 11.9” (19” Rack Mountable)

Notes:

1. Over whole range of SPRT, -200°C to 962°C. For Ro=0.25Ω increased by a factor of 2.5
2. E.g.: 25Ω SPRT with 25Ω 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.

---

**microK Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>microK 70</th>
<th>microK 125</th>
<th>microK 250</th>
<th>microK 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy Whole Range (SPRT Ro ≥ 2.5Ω)</td>
<td>0.07ppm</td>
<td>0.125ppm</td>
<td>0.25ppm</td>
<td>0.5ppm</td>
</tr>
<tr>
<td>Accuracy Ratio 0.95 to 1.05</td>
<td>0.017ppm</td>
<td>0.03ppm</td>
<td>0.06ppm</td>
<td>0.125ppm</td>
</tr>
<tr>
<td>Equivalent Temperature Accuracy</td>
<td>0.017mK</td>
<td>0.03mK</td>
<td>0.06mK</td>
<td>0.125mK</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.001mK</td>
<td>0.001mK</td>
<td>0.01mK</td>
<td>0.01mK</td>
</tr>
<tr>
<td>Resolution Voltage</td>
<td>10nV</td>
<td>10nV</td>
<td>10nV</td>
<td>10nV</td>
</tr>
<tr>
<td>Resistance Range</td>
<td>0 - 100 kΩ</td>
<td>0 - 100 kΩ</td>
<td>0 - 500 kΩ</td>
<td>0 - 500 kΩ</td>
</tr>
<tr>
<td>Voltage Range (Thermocouple)</td>
<td>±125mV</td>
<td>±125mV</td>
<td>±125mV</td>
<td>±125mV</td>
</tr>
<tr>
<td>Internal Resistance</td>
<td>25, 100, 400Ω</td>
<td>25, 100, 400Ω</td>
<td>1, 10, 25, 100, 400Ω</td>
<td>1, 10, 25, 100, 400Ω</td>
</tr>
<tr>
<td>Standards</td>
<td>TCR &lt;0.05ppm/°C</td>
<td>Annual Stability &lt;2ppm/year</td>
<td>TCR &lt;0.6ppm/°C &lt;5ppm/year</td>
<td>TCR &lt;0.6ppm/°C &lt;5ppm/year</td>
</tr>
<tr>
<td>Interfaces</td>
<td>RS232, GPIB &amp; USB &amp; Ethernet</td>
<td>RS232, GPIB, USB</td>
<td>RS232, GPIB, USB</td>
<td>RS232, GPIB, USB</td>
</tr>
<tr>
<td>Power</td>
<td>25W maximum, 1.5A (RMS) maximum</td>
<td>20W maximum, 1.5A (RMS) maximum</td>
<td>25,100,400 &lt;0.3ppm/°C &lt;5ppm/year</td>
<td>25,100,400 &lt;0.3ppm/°C &lt;5ppm/year</td>
</tr>
<tr>
<td>Weight</td>
<td>13.3kg</td>
<td>13.3kg</td>
<td>12.4kg</td>
<td>12.4kg</td>
</tr>
</tbody>
</table>

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Notes:

1. Over whole range of SPRT, -200°C to 962°C. For Ro=0.25Ω increased by a factor of 2.5
2. E.g.: 25Ω SPRT with 25Ω 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.
Channel Expander
microsKanner

- Expandable to 90 channels
- Supports PRTs, thermocouples & thermistors
- Plug-and-play operation

The microsKanner can be used with any member of the microK family to add further channels, up to a maximum of 90 expansion channels.

**Easy to Use:** The use of plug-and-play technology means that the extra channels appear automatically on your microK bridge when connected to a microsKanner. You can configure the new input channels in exactly the same way as any of the microK’s existing inputs (through the microK’s touch screen or a PC, via an RS232 connection). You just plug in a microsKanner and immediately gain the benefit of the additional channels, making this the easiest channel expansion system of its type.

**Accurate:** The microsKanner replicates the input system of the microK bridge for all 10 of its input channels. Measurements made with a microsKanner are therefore to the same accuracy as the microK bridge it is connected to. By adding further scanners the microK system can be expanded to 92 channels without losing measurement performance.

**Versatile:** Like the microK bridge, the microsKanner works with PRTs, thermocouples and thermistors giving you unparalleled flexibility.

**Keep-Warm Currents:** The microsKanner has 10 individually programmable keep-warm current sources to maintain the power in PRTs when they are not being measured, eliminating uncertainty caused by power coefficients.

**Cable Pod™ Connector System:** The connectors accept 4mm plugs, spades or bare wires. The standard ¾” separation is compatible with standard 4mm to BNC adaptors, so you can use thermometers with any standard termination type. The Cable Pod™ connector system uses gold-plated, tellurium-copper to give the lowest possible thermal EMF and the best measurement uncertainty.

**Reliable:** Like the microK, the microsKanner uses the latest semiconductor technology for channel selection and signal routing. This completely solid-state design therefore provides the highest possible reliability.

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**Specifications:**

<table>
<thead>
<tr>
<th>Model</th>
<th>microsKanner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>10</td>
</tr>
<tr>
<td>Keep-Warm Currents</td>
<td>0-10mA ±0.4% of value, ±7µA, resolution 2.5µA</td>
</tr>
<tr>
<td>Input connectors</td>
<td>Cable Pod™ connector accepting: 4mm plugs, spades or bare wires</td>
</tr>
<tr>
<td>Contact material</td>
<td>Gold plated tellurium copper</td>
</tr>
<tr>
<td>Interface</td>
<td>RS232 (9600 baud)</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>15-30°C / 50-85°F, 10-90% RH (for full specification) 0-50°C / 32-120°C, 0-99% RH (operational)</td>
</tr>
<tr>
<td>Power</td>
<td>88-264V (RMS), 47-63Hz (Universal) 10W maximum, 1.2A (RMS) maximum</td>
</tr>
<tr>
<td>Size</td>
<td>520mm x 166mm x 300mm / 20.5” x 6.6” x 11.9” (W x D x H)</td>
</tr>
<tr>
<td>Weight</td>
<td>12.6kg / 28lb</td>
</tr>
</tbody>
</table>
True Temperature Indicator
TTI - 22

- No mechanical relays, long life
- Warns if calibration due date exceeded
- Accuracy to 0.001°C, 1mK

Quite simply the Isotech TTI-22 High Accuracy Thermometer sets new standards in the price to performance ratio for industrial and secondary resistance thermometry. If you need high accuracy at an affordable price you have to look at the TTI-22.

The TTI-22 has an accuracy of 0.001°C and a resolution of 0.0001°C (0.00004 Ohms). It has two input channels, is lightweight (1.8kg) and will operate for more than 10 hours from two small AA cells. It has both RS232 and Ethernet ports.

Simple to use, supporting both Industrial 100 Ohm probe and SPRTs to ITS-90, 25.5 and 100 Ohm. Up to 30 probe calibrations can be stored along with the calibration expiry date so the instrument can warn when the calibration time has been exceeded.

Built in statistics calculation can show you both the measured and average values along with the standard deviation over previous measurements.

The Isotech TTI-22 is ideal as a reference standard alongside liquid calibration baths, for the smallest uncertainty calibration with Dry Blocks or for demanding stand alone measurement applications.

Previously this level of performance was confined to specialist laboratories with expensive thermometry bridges; TTI-22 delivers 5 to 10 times the performance of comparably priced instruments.

The TTI-22 uses the same patented measurement technique as the earlier TTI-2.

Each measurement performs a zero point and gain correction.

The switched polarity DC measuring current (0.4mA) eliminates thermal EMFs.

Surface mount construction ensures long term reliability.

<table>
<thead>
<tr>
<th>Model</th>
<th>TTI-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>2 channel Pt100 (BS EN 60751 / IEC 751) or 25.5/100Ω SPRT to ITS-90</td>
</tr>
<tr>
<td>Measuring Current</td>
<td>0.41mA</td>
</tr>
<tr>
<td>Self Heating Test Current</td>
<td>0.29mA (0.41mA / √2)</td>
</tr>
<tr>
<td>Measuring Time</td>
<td>1.44 seconds for both channels</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>-250 to 960°C (0 to 440 Ohm)</td>
</tr>
<tr>
<td>Resolution</td>
<td>Temperature: 0.0001°C, 0.1mK Resistance: 0.00004Ω, 40 μΩ</td>
</tr>
<tr>
<td>Uncertainty of Measurement</td>
<td>Temperature: 0.001°C, 1mK 100 Ohm PRT Resistance: 0.4mΩ @ 20°C Instrument only, uncertainty with sensor dependant on range and sensor type.</td>
</tr>
<tr>
<td>Reference Resistor</td>
<td>Internal 380Ω TCR ±0.3ppm / °C Stability ±5ppm / year</td>
</tr>
<tr>
<td>Interface</td>
<td>RS232, Ethernet, built-in web server provides simple temperature display</td>
</tr>
<tr>
<td>Ambient Temp. Range</td>
<td>10°C to 30°C</td>
</tr>
<tr>
<td>Power Supply</td>
<td>7.5VDC, 250mA power adaptor or 2 x AA batteries (typically &gt;10 hours operating time)</td>
</tr>
<tr>
<td>Case Dimensions</td>
<td>Width: 190mm Height: 112mm Depth: 240mm Weight: 1.8kg</td>
</tr>
</tbody>
</table>
The TTI-22 continually compares the connected sensor to a highly stable precision internal reference resistor. For a Pt100 at 0°C the annual stability for absolute measurement is typically ±1.3mK (5ppm x 100Ω = 0.5mΩ / 1.3mK).

For comparison calibration, when a reference probe is compared to a calibrated standard, the long term stability is not important as any change of value is cancelled in the comparison. The temperature coefficient is 0.3ppm / °C and the measuring time, for both channels, is just 1.44 seconds.

The instrument can be configured to measure ratio of the measured resistance of the two input channels, a technique familiar to users of older style thermometry bridges.

The overall uncertainty of the instrument and probe together will be determined by the model of probe and the temperature range. For the majority of applications the contribution of the instrument uncertainty will be negligible compared to the uncertainty of the calibrated probe.

Recommended probes include the Isotech 909/100 and 670SQ /100, 935-14-16, 935-14-95L and H.

The TTI-22 includes Cal Notepad software for easy monitoring and logging of data. It is fully compatible with Isotech I-Cal Easy which can automate comparison calibration.

http://www.isotech.co.uk
The milliK Precision Thermometer from Isotech sets a new standard for the high accuracy measurement and calibration of Platinum Resistance Thermometers, Thermistors, Thermocouple and Process Instrumentation (4-20mA) over the range -270°C to 1820°C.

In addition to low uncertainty measurements from Reference Standards and Industrial sensor measurement the milliK can control Isotech temperature sources, sequencing through a programmable list of temperature set points and log data to internal memory or a USB drive.

The milliK forms the hub of a measurement system, reading SPRTs, RTDs, Thermistors, Thermocouples and 4 - 20mA current inputs with the option to control calibration baths and log readings accurately.

Benefits You
The milliK sets a new standard for value, versatility and accuracy - < ±5ppm over range for PRTs, ±2µV for Thermocouples and ±1µA for current transmitters, see table.

Supporting a wide range of sensors and functions it replaces individual devices making a cost effective calibration solution.

A robust design and operation from AC or DC power allows the milliK to be used in the laboratory, test room or out in the field.

The milliK can display in °C, °F, K, Ohms, mV and mA with numeric and graphical display modes. The large back lit display makes configuring the instrument and setting the scrolling strip charts intuitive. The USB port allows for the use of a mouse, keyboard or USB Drive.

Built on World Leading Technology
In 2006 Isotech launched the microK range of thermometry bridges which quickly established themselves as the instrument of choice for National Metrology Institutes and Primary Laboratories with innovative features, accuracy and versatility.

In response to industry demands for greater accuracy, the milliK now brings the same design philosophy of the microK to those outside the Primary Laboratory. Users calibrating industrial sensors in the laboratory, pharmaceutical plants, food and beverage plants, aerospace, power industries and service companies will welcome the milliK as a solution to increase measurement confidence, ensure high accuracy traceable calibration, improve quality as well as ensure safety and lower energy consumption.

No Compromise Design
The design team have considered industrial users and applications in order to avoid measurement errors and problems encountered in some instruments from other manufacturers.

- Eliminates Thermal EMF Errors in PRTs
  Fast current reversal technology and solid state switching eliminate thermal EMF effects avoiding the errors that occur with fixed DC instruments.

- Lead Wire Correction
  PRT lead wire errors are eliminated for up to 30m of four core screened cable.

- Galvanic Isolation
  Not only are the two sensor channels galvanically isolated, the 4 - 20mA input is also separately isolated. The benefits of the advance design are no ground loops, improved safety and noise immunity.

High Resolution
The display resolution is 0.0001°C (0.1mK) made possible by using a powerful Sigma Delta Analogue to Digital converter to achieve a true measuring resolution of just 28µΩ equivalent to 0.00007°C (0.07mK) for PRT inputs.

Automation
The milliK is compatible with I-cal EASY and the Isotech range of PRT and Thermocouple Selector Switches, enabling users to build fully automatic calibration systems for up to 32 temperature sensors with the ability to calculate coefficients and print tables and certificates.
Reliable
Like the award winning microK range, the milliK is all solid state. There are no mechanical relays, switches or potentiometers which would reduce reliability.

Input Connectors
No compromise design ruled out lower cost problematic connectors and the SPRT / PRT inputs are via the highest quality gold plated push / pull self latching circular connectors overcoming the problems seen elsewhere where thermometers have been designed to a budget.

Outstanding CJC Performance and Flexibility
Again, the no compromise design philosophy led to a specially developed rugged thermocouple connector made from alumina and incorporating the same type of platinum sensor as used in Isotech precision probes ensuring optimal cold junction accuracy.

Three CJC modes allow thermocouple operation with internal automatic compensations, external 0°C reference systems or the milliK can measure the junction with a probe on an unused channel, useful for automated systems.

21st Century Design
Utilising a powerful internal operating system and fast 32 Bit processor the milliK has the power and capacity to overcome the memory limitations of older instruments.

Store Probe Data
There is sufficient memory for an almost unlimited number of standard probes, allowing the storing of calibration data for both resistance thermometers and thermocouples. The digital matching of probe data allows the instrument to show the true temperature. The instrument will warn if a probes calibration time has expired.

Data Logging
Older instruments are limited to a maximum number of logged data points, the milliK is limited only by storage space. The internal memory can store more than six months of data, and with a low cost USB Memory stick the milliK can log continuously for a lifetime.

Data Management
Probe data and logged measurements can be exported to a USB Memory drive at the push of a button. Additionally the instrument is future proof with future software updates applied from a USB drive.

Connectivity and Communications
With USB host, two serial interfaces and Ethernet it is easy to communicate with the milliK whether it is on the bench next to a PC or remote by using a LAN or WAN connection. These interfaces are fitted as standard.

The milliK includes a PC lead and Cal Notepad software.

Open Calibration
The milliK is readily calibrated against resistance and voltage standards. There are no internal adjustments and the calibration commands are simply sent via RS232 or from the front panel (password protected). The procedure is open and fully documented unlike some other instruments where there is no choice but to return to the manufacturer.

1 The milliK can connect to Isotech temperature sources
Dry Blocks, Liquid Baths and Furnaces
Can cycle the bath through a series of temperatures logging the data - all without a PC.

2 Wide range of sensors
The milliK can use Standard Reference probes and read from industrial sensors being calibrated, including 4 - 20mA transmitters - all to high accuracy.

3 Logs
The milliK can record time stamped data to internal memory or a USB Memory Drive.

4 Safety
The milliK inputs are galvanically isolated, with the 4 - 20mA input separately isolated avoiding problems with high voltage pick up common when using thermocouples in high temperature furnaces.

5 Designed to eliminate and protect against real world problems
The milliK eliminates thermal EMF errors, compensates for lead wire resistance and warns if a probe is out of calibration.

6 High accuracy
For demanding industrial and laboratory applications, the milliK features probe matching for all sensor types, self heating test, exceptional CJC performance and high stability internal standards.
### Specifications

<table>
<thead>
<tr>
<th>Input Channels</th>
<th>3</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Channels 1+2</td>
<td>SPRTs, PRTs, Thermistor and Thermocouples</td>
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<tr>
<td>Channel 3</td>
<td>Process Inputs 4 - 20mA</td>
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<tr>
<td>Ranges</td>
<td>SPRTs: 0-115Ω</td>
<td>PRTs: 0-460Ω</td>
<td>Thermistors: 0-32kΩ, 0-130kΩ, 0-490kΩ</td>
<td>Thermocouples: ±115mV</td>
<td>4-20mA: 0-30mA</td>
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<tr>
<td>Units</td>
<td>°C, °F, K, Ω, mV, mA</td>
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<tr>
<td>Accuracy</td>
<td>Initial: 5ppm</td>
<td>7ppm</td>
<td>Over 1 year: 7ppm</td>
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<tr>
<td>SPRTs/PRTs:</td>
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<tr>
<td>Thermistors:</td>
<td>50ppm</td>
<td>150ppm</td>
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<tr>
<td>Thermocouples:</td>
<td>2µV</td>
<td>4µV</td>
<td>0.002mA</td>
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<td>4-20mA:</td>
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<tr>
<td>Temperature Accuracy</td>
<td>Initial: 3mK</td>
<td>4mK</td>
<td>Over 1 year: 4mK</td>
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<tr>
<td>SPRTs/PRTs (at 0°C):</td>
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<tr>
<td>(over full range):</td>
<td>5mK</td>
<td>7mK</td>
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<tr>
<td>Thermistors:</td>
<td>50ppm</td>
<td>150ppm</td>
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<tr>
<td>Thermocouples:</td>
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<tr>
<td>Type B:</td>
<td>±0.23°C</td>
<td>±0.46°C</td>
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<tr>
<td>Type E:</td>
<td>±0.03°C</td>
<td>±0.06°C</td>
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<tr>
<td>Type J:</td>
<td>±0.04°C</td>
<td>±0.07°C</td>
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<tr>
<td>Type K:</td>
<td>±0.05°C</td>
<td>±0.10°C</td>
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<tr>
<td>Type L:</td>
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<td>±0.07°C</td>
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<tr>
<td>Type N:</td>
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<td>±0.12°C</td>
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<tr>
<td>Type R:</td>
<td>±0.17°C</td>
<td>±0.34°C</td>
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<td>Type S:</td>
<td>±0.19°C</td>
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<td>Type T:</td>
<td>±0.05°C</td>
<td>±0.09°C</td>
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<tr>
<td>Au-Pt:</td>
<td>±0.12°C</td>
<td>±0.23°C</td>
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<tr>
<td>Resolution</td>
<td>Resistance (PRTs): 0.000001Ω</td>
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<tr>
<td></td>
<td>(Thermistors): 0.001Ω</td>
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<tr>
<td></td>
<td>Voltage: 0.00001mV</td>
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<tr>
<td></td>
<td>Current: 0.001mA</td>
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<tr>
<td></td>
<td>Temperature: 0.0001°C</td>
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<tr>
<td>Temperature Conversions</td>
<td>PRTs: IEC60751(2008), Callendar-van Dusen, ITS90</td>
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<tr>
<td></td>
<td>Thermocouples: IEC584-1 1995 (B,E,J,K,N,R,S,T), L, Au-Pt</td>
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<td>Thermistors: Steinhart-Hart, polynomial</td>
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<tr>
<td>Sensor Currents</td>
<td>SPRTs/PRTs: 1mA and 1.428mA</td>
<td>±0.4% (reversing)</td>
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<tr>
<td></td>
<td>Thermistors: 5µA (reversing)</td>
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<tr>
<td>Keep-Warm Current</td>
<td>SPRTs/PRTs: 1mA and 1.428mA</td>
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</tbody>
</table>

**Input Connectors:**
- SPRTs/PRTs: LemoEPG.1B.306. HLN 6-pin gold plated contacts
- Thermocouples: Miniature Thermocouple socket (ASTM E 1684-05)
- 4-20mA: 4mm sockets

**Interfaces:**
- 10/100MBit Ethernet (RJ45 socket)
- USB (2.0) host
- 2 x RS232 (9-pin D-type plug, 9600 Baud)

**Display:**
- 89mm / 3.5” QVGA (320 x 240) colour
- TFT LCD with LED backlight

**Operating Conditions:**
- Operating: 0-45°C / 32-113°F
- 0.99% humidity
- Full Specification: 15-30°C / 50-85 °F, 10-90% humidity

**Display Units:** °C, °F, K, Ohms, mV and mA

**Statistics:**
- In Addition to Instantaneous Display user can select mean of 2 - 100 measurements with Standard Deviation

**Measurement Time:**
- 950mS

**Cable Length:**
- Limited to 10Ω per core or 10nF shunt capacitance (equivalent to 100m of typical 4-core screened PTFE cable)

**Logging:**
- Capacity to store > 180 Days of time stamped measurements to internal memory

**Recommended Probes:**
- Isotech Semi Standard PRTs
- Isotech Model 909 SPRT

**Power:**
- 88-264V (RMS), 47-63Hz (universal), 6W maximum or 4 x AA cells

**Dimensions:**
- 255mm x 255mm x 114mm / 10” x 10” x 4.5” (W x D x H)

**Weight:**
- 2.25kg / 5lb

**Optional Carring Case:**
- 931-22-102

**NOTE:** Due to our program of continual development and improvement, we reserve the right to amend or alter characteristics and design without prior notice.