



# Precision Thermometer milliK

- Wide Range of Sensors, SPRTs, PRTs, Thermistors, Thermocouple and 4 - 20mA
- High Accuracy,  $< \pm 5\text{ppm}$  for PRTs,  $\pm 2\mu\text{V}$  for Thermocouples and  $\pm 1\mu\text{A}$  Transmitters
- Logs - Controls Isotech Temperature Sources  
Massive logging capacity – controls Dry Blocks and Liquid Baths

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  $-270^{\circ}\text{C}$  to  $1820^{\circ}\text{C}$ .

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.

## Benefiting You

The milliK sets a new standard for value, versatility and accuracy -  $< \pm 5\text{ppm}$  over range for PRTs,  $\pm 2\mu\text{V}$  for Thermocouples and  $\pm 1\mu\text{A}$  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  $^{\circ}\text{C}$ ,  $^{\circ}\text{F}$ , 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.



*The Isotech milliK  
High Accuracy Measurement  
Controls Calibration Baths  
Logs Data*

## 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  $0.0001^{\circ}\text{C}$  (0.1mK) made possible by using a powerful Sigma Delta Analogue to Digital converter to achieve a true measuring resolution of just  $28\mu\Omega$  equivalent to  $0.00007^{\circ}\text{C}$  (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.



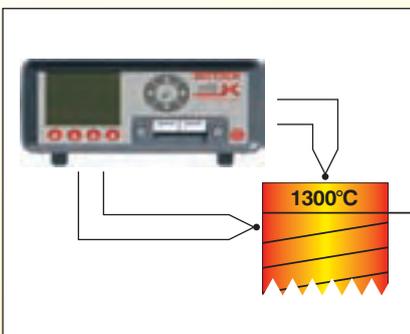
**2 Wide range of sensors**

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



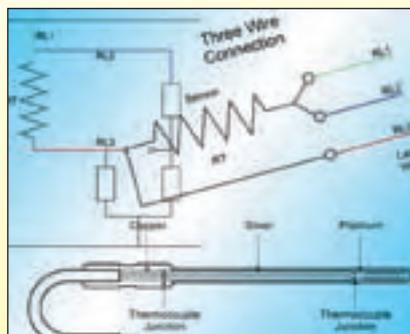
**3 Logs**

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



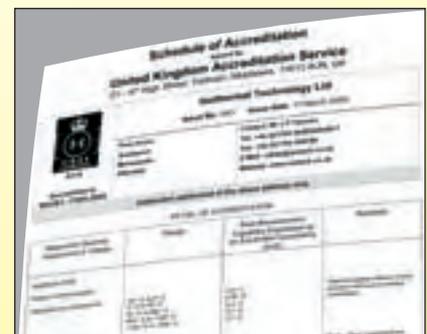
**4 Safety**

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.

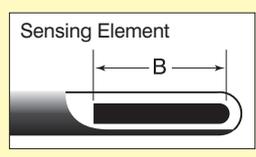
## Specifications

|                         |   |   |
|-------------------------|---|---|
| Input Channels          | 3   |   |
| Channels 1+2            | SPRTs, PRTs, Thermistor and Thermocouples                       |   |
| Channel 3               | Process Inputs 4 - 20mA<br>Isolated 24VDC Power Supply Included |   |
| Ranges                  | SPRTs:  | 0-115Ω                                      |
|                         | PRTs:   | 0-460Ω                                      |
|                         | Thermistors:  | 0-32kΩ, 0-130kΩ, 0-490kΩ                    |
|                         | Thermocouples:  | ±115mV                                      |
|                         | 4-20mA:   | 0-30mA                                      |
| Units                   | °C, °F, K, Ω, mV, mA  |   |
| Accuracy                | Initial   | Over 1 year                                 |
| SPRTs/PRTs:             | 5ppm  | 7ppm  |
| Thermistors:            | 50ppm   | 150ppm                                      |
| Thermocouples:          | 2μV   | 4μV   |
| 4-20mA:                 |   | 0.002mA                                     |
| Temperature Accuracy    | Initial   | Over 1 year                                 |
| SPRTs/PRTs (at 0°C):    | 3mK   | 4mK   |
| (over full range):      | 5mK   | 7mK   |
| Thermistors:            | 50ppm   | 150ppm                                      |
| Thermocouples:          |   |   |
| Type B:                 | ±0.23°C   | ±0.46°C                                     |
| Type E:                 | ±0.03°C   | ±0.06°C                                     |
| Type J:                 | ±0.04°C   | ±0.07°C                                     |
| Type K:                 | ±0.05°C   | ±0.10°C                                     |
| Type L:                 | ±0.04°C   | ±0.07°C                                     |
| Type N:                 | ±0.06°C   | ±0.12°C                                     |
| Type R:                 | ±0.17°C   | ±0.34°C                                     |
| Type S:                 | ±0.19°C   | ±0.38°C                                     |
| Type T:                 | ±0.05°C   | ±0.09°C                                     |
| Au-Pt:                  | ±0.12°C   | ±0.23°C                                     |
| Resolution              | Resistance (PRTs):  | 0.00001Ω                                    |
|                         | (Thermistors):  | 0.001Ω                                      |
|                         | Voltage:  | 0.00001mV                                   |
|                         | Current:  | 0.001mA                                     |
|                         | Temperature:  | 0.0001°                                     |
| Temperature Conversions | PRTs:   | IEC60751 (2008), Callendar-van Dusen, ITS90 |
|                         | Thermocouples:  | IEC584-1 1995 (B,E,J,K,N,R,S,T), L, Au-Pt   |
|                         | Thermistors:  | Steinhart-Hart, polynomial                  |
| Sensor Currents         | SPRTs/PRTs:   | 1mA and 1.428mA ±0.4% (reversing)           |
|                         | Thermistors:  | 5μA (reversing)                             |
| Keep-Warm Current       | SPRTs/PRTs:   | 1mA and 1.428mA                             |

|                        |  |   |
|------------------------|--|---|
| Input Connectors       | SPRTs/PRTs:  | LemoEPG.1B.306.<br>HLN 6-pin gold plated contacts |
|                        | Thermocouples:   | Miniature Thermocouple socket (ASTM E 1684-05)    |
|                        | 4-20mA:  | 4mm sockets                                       |
| Interfaces             | 10/100MBit Ethernet (RJ45 socket)<br>USB (2.0) host<br>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,<br>0-99% humidity              |
|                        | Full Specification:  | 15-30°C / 50-85 °F,<br>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<br>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 Carrying 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.



■ Recommended Probes (Fit milliK Case)

| Model          | Maximum Range   | Diameter | Length (A) | Sensing Length (B) | Handle (C) | Cable   | Application                        |
|----------------|-----------------|----------|------------|--------------------|------------|---------|------------------------------------|
| 935-14-61/TTI  | -50°C to 250°C  | 4mm      | 300mm      | 6mm                | 19 x 120mm | 2m PTFE | Fast Response, Low Stem Conduction |
| 935-14-116/TTI | -100°C to 450°C | 6mm      | 350mm      | 25mm               | 19 x 120mm | 2m PTFE | General Purpose                    |

For further options and details, see Reference Probes - Semi Standards, pages 68-73.

For laboratory standard thermometers we recommend for SPRTs the Isotech Model 909Q and for thermocouples the Model 1600 Type R, see Catalogue 1: Solutions from Primary & Secondary Laboratories.



**UKAS Calibration** available for these systems - *International Traceability - Best Practice*

