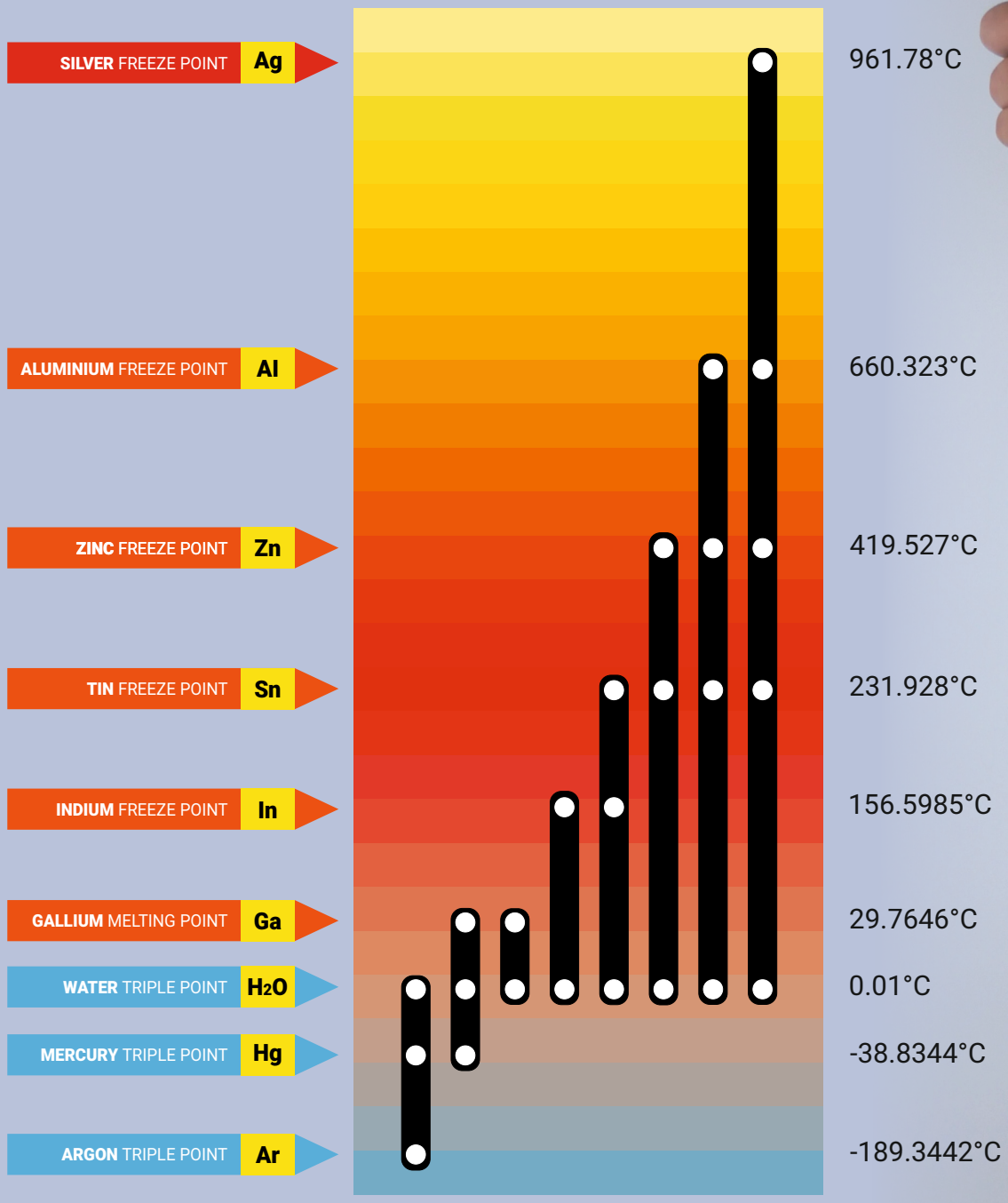
milliK

High Accuracy Temperature Measurement

Complete Measuring Systems...

ITS-90 sub-ranges

for Thermometer Calibration



Example 1: "I need to measure to 200°C, what calibration should I select?"

"The ITS-90 sub-range of Water Freeze Point (0.01°C) to the Tin freeze point (231.928°C). The chart shows you need three points, the Water Freeze Point, Indium Freeze Point and Tin Freeze Point."

Example 2: "I want to use my sensor at 650°C, what calibration should I select?"

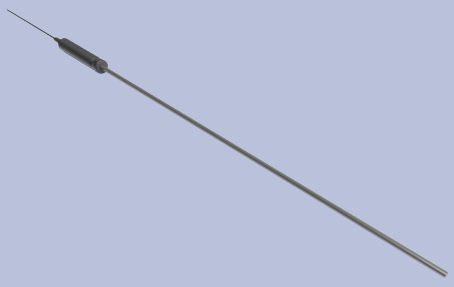
"The ITS-90 sub-range of Water Freeze Point (0.01°C) to the Aluminium freeze point (660.323°C). The chart shows you need four points, the Water Freeze Point, Tin Freeze Point, Zinc Freeze Point and the Aluminium Freeze Point."

...the source for calibration professionals

Complete Measuring System Guide

STEP 1
Choose milliK...

STEP 2
Choose sensor...



STEP 3
Choose calibration...

CERTIFICATE OF CALIBRATION

ISSUED BY: ISOTHERMAL TECHNOLOGY LIMITED

DATE OF ISSUE:

CERTIFICATE NO:

ISOTECH

N. T. P. L.

Page 1 of 3

Approved Signatory
Name:
Signature:

CUSTOMER:

CUSTOMER ORDER: ITL REFERENCE:

DATE OF CALIBRATION: From to

DESCRIPTION: An Isotech milliK Digital Thermometer a 025-14-95H Semi Standard Platinum Resistance Thermometer

IDENTIFICATION: milliK Serial No.
Channel 1 Pt1 Serial No.

BASIS OF CALIBRATION:

Prior to the calibration the milliK was calibrated with the PRTs and the resistance values displayed by the milliK were used with the calibration temperatures to determine IT1990 coefficients which were programmed into the milliK. The milliK was then used to measure the resistance of the PRTs and calculate the error from the PRT immersed in fixed point cells at the melting points of Aluminium (660.3 °C), Zinc (419.5 °C) and Tin (231.9 °C). For the 0.010 °C and 20.7646 °C points the appropriate fixed point cell was used

All measurements are traceable to recognised National Standards and the temperature scale in use at this Laboratory is the International Temperature Scale of 1990 (ITS90).

This Laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communique dated January 2009). The joint Communique is available on the ILAC website at www.ilac.org on the publications and resources page.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The Northern Temperature Primary Laboratory is the Calibration Laboratory of Isothermal Technology Limited

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The world's leading National Metrology Institutes choose Isotech...

Shouldn't you?

The company is always willing to give technical advice and assistance where appropriate.

Equally, because of the program of continual development and improvement, we reserve the right to amend or alter characteristics and design without prior notice.

This publication is for information only.

milliK Precision Thermometer / -270°C to 1820°C

High accuracy for SPRTs, PRTs, Thermocouples, Thermistors and Current Transmitters with flexible expansion.

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.

The milliK has two input channels for sensors and a third channel for current. It can be expanded to become a measuring system with up to 33 channels reading SPRTs, PRTs, Thermistors, or Thermocouples with the option to control calibration baths and log readings accurately.

Wide Range of Sensors:
SPRTs, PRTs, Thermistors, Thermocouple and 4 - 20mA
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 Data Sheet.

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

SPRT/PRT, Thermocouple, & Thermistor Precision Thermometer

- Range: -270°C to 1820°C (3308°F)
- Accuracy: ±0.005°C (±5mK) full range for PRTs
- Resolution: 0.0001°C (0.1mK)
- SPRT/PRT, Thermocouple, Thermistor and 4-20mA Inputs
- Full colour graphical display
- Store up to 180 days of measurements
- Control Isotech calibration baths

Choose milliK for...

- Accuracy: Best in class ±0.003°C (±3mK) at 0°C
- Calibration and precision measurement
- Features: Cycles Isotech Blocks and Baths through a series of calibration temperatures whilst logging the data - all without a PC
- USB: Export logged data - connect a mouse and keyboard for ease of operation

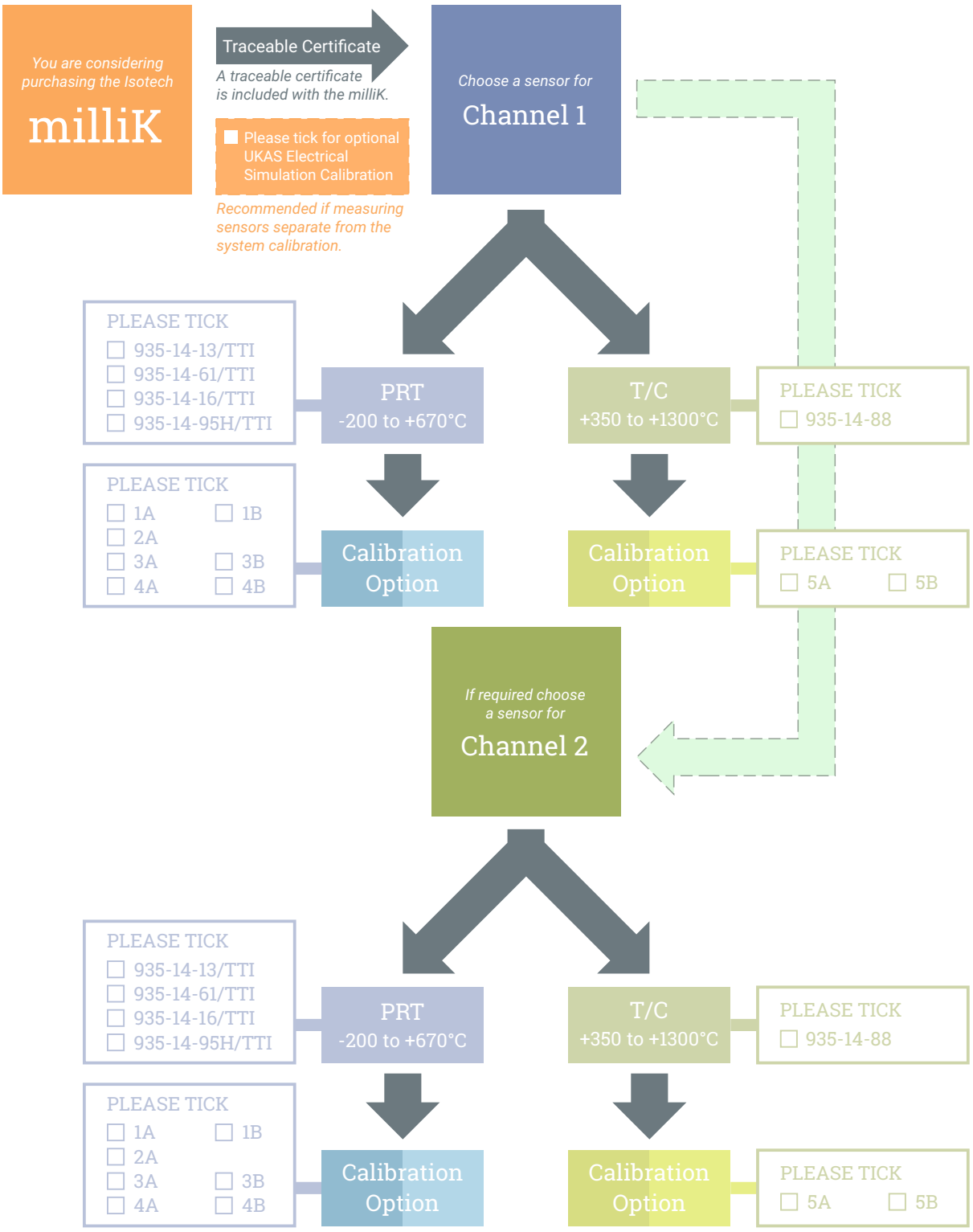
For more information:
ISOTECH.CO.UK

UKAS Calibration Options
ISO 17025

milliK - Flexible Operation

1. Connect current transmitters
2. USB interface for mouse, keyboard and pen-drive
3. Control Isotech blocks with automated temperature stepping
4. Optional carry case
5. Optional terminal adapter for bare wires, forks or 4mm plugs
6. Add up to four millisKanners for maximum of 32 expansion channels
7. Serial and Ethernet ports for remote control
8. Connect thermocouples, PRTs, SPRTs and thermistors

Easy system builder...



Order Code Example

unit		calibration		channel 1 sensor		channel 1 calibration		channel 2 sensor		channel 2 calibration
milliK	–	UKAS	–	935-14-13-TTI	–	1A	–	935-14-88	–	5B

Recommended Sensors

935-14-13 Semi-standard PRT

- Low Temperature Probe Optimized -196°C to 250°C
- 6mm x 350mm Sheath with 25mm Sensing Element
- Recommended for Low Temperatures

935-14-61 Semi-standard PRT

- Fast Response General Purpose Probe -50°C to 250°C
- 4mm x 300mm Sheath with 6mm Sensing Element
- Recommended for General Purpose Use

935-14-16 Semi-standard PRT

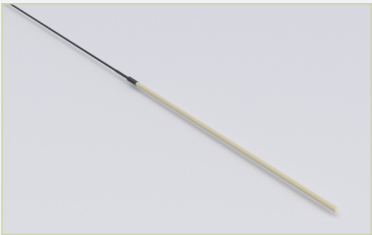
- Wide Range Probe -100°C to 450°C
- 4mm x 450mm Sheath with 25mm Sensing Element
- Recommended for Wide Temperature Ranges

935-14-95H Semi-standard PRT

- High Temperature Probe -80°C to 670°C
- 6mm x 480mm Sheath with 25mm Sensing Element
- Recommended for high temperature use to 670°C

These Isotech industrial platinum resistance thermometers are ideal for both laboratory and portable use. This range is suitable for use as working standards in Dry Blocks and Liquid Baths or as high accuracy sensors for our range of precision thermometers and bridges.

All of these thermometers are metal sheathed and are both less fragile and more affordable than the Isotech range of true Standard Platinum Resistance Thermometers that are normally used in laboratories. Details of these are to be found in our publication "Solutions for Primary and Secondary Laboratories".



935-14-88 Semi-standard T/C

- Working Standard Probe 5 x 300mm
- 1.3 M Type R Wire (All Platinum)
- Recommended for Most Applications

These thermocouples are suitable for use as references in Isotech Dry Blocks and for use with temperature indicators. Details of our laboratory grade Standard Thermocouples with separate cold junctions can be found in our publication "Solutions for Primary and Secondary Laboratories". These semi standards are lower cost and suitable for a variety of industrial applications.

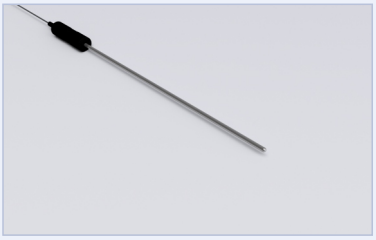
Isotech Semi Standard Platinum Resistance Thermometers

- High Accuracy Low Drift Thermometers
- Wire Wound Platinum Coil Elements
- Thermally Preconditioned for Optimal Stability

Platinum Resistance Thermometers

-196°C to 250°C
935-14-13 Semi-standard PRT

☐ Channel 1 ☐ Channel 2



Option 1A

-196°C	-38.8°C	0.01°C	156°C	232°C
uncertainty ±0.030°C	uncertainty ±0.015°C	uncertainty ±0.015°C	uncertainty ±0.025°C	uncertainty ±0.025°C

☐ Channel 1 ☐ Channel 2

Option 1B

-196°C	-38.8°C	0.01°C	29.76°C
uncertainty ±0.030°C	uncertainty ±0.015°C	uncertainty ±0.015°C	uncertainty ±0.015°C

☐ Channel 1 ☐ Channel 2

■ Recommended for Low Temperatures

-50°C to 250°C
935-14-61 Semi-standard PRT

☐ Channel 1 ☐ Channel 2

Option 2A

-50°C	0.01°C	29.76°C	156°C	250°C
uncertainty ±0.025°C	uncertainty ±0.015°C	uncertainty ±0.015°C	uncertainty ±0.025°C	uncertainty ±0.030°C

☐ Channel 1 ☐ Channel 2

■ Recommended for General Purpose Use

-100°C to 450°C
935-14-16 Semi-standard PRT

☐ Channel 1 ☐ Channel 2

Option 3A

-80°C	-38.8°C	0.01°C	232°C	419°C
uncertainty ±0.030°C	uncertainty ±0.015°C	uncertainty ±0.015°C	uncertainty ±0.025°C	uncertainty ±0.040°C

☐ Channel 1 ☐ Channel 2

Option 3B

0.01°C	232°C	419°C
uncertainty ±0.015°C	uncertainty ±0.025°C	uncertainty ±0.040°C

☐ Channel 1 ☐ Channel 2

■ Recommended for Wide Temperature Ranges

-80°C to 670°C
935-14-95H Semi-standard PRT

☐ Channel 1 ☐ Channel 2

Option 4A

-80°C	-38.8°C	0.01°C	232°C	419°C	660°C
uncertainty ±0.030°C	uncertainty ±0.015°C	uncertainty ±0.015°C	uncertainty ±0.025°C	uncertainty ±0.040°C	uncertainty ±0.050°C

☐ Channel 1 ☐ Channel 2

Option 4B

0.01°C	232°C	419°C	660°C
uncertainty ±0.015°C	uncertainty ±0.025°C	uncertainty ±0.040°C	uncertainty ±0.050°C

☐ Channel 1 ☐ Channel 2

■ Recommended for High Temperature Use

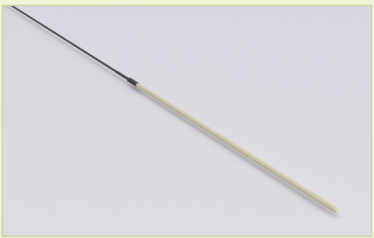
Isotech Nobel Metal Thermocouples

- High Accuracy to 1300°C
- Type R Noble Metal: Platinum / Platinum Rhodium
- Ceramic Sheath

Whilst Platinum Resistance Thermometers have higher accuracy they cannot go to very high temperatures, for higher temperatures choose our noble metal thermocouples.

Type R Thermocouple

0°C to 1300°C
935-14-88 Semi-standard T/C
☐ Channel 1 ☐ Channel 2



Option 5A

350°C	600°C	850°C	1100°C
uncertainty ±0.8°C	uncertainty ±0.8°C	uncertainty ±0.8°C	uncertainty ±0.8°C
	☐ Channel 1	☐ Channel 2	

Option 5B

350°C	700°C	1000°C	1300°C
uncertainty ±0.8°C	uncertainty ±0.8°C	uncertainty ±0.8°C	uncertainty ±1.8°C
	☐ Channel 1	☐ Channel 2	

■ Recommended for use above 660°C

These are our recommended sensors for the milliK,
we have many more options, for more details please contact us...

https://isotech.co.uk/consultancy/

Looking for more Channels?

Channel Expander **millisKanner**

- Expands milliK to a maximum of 33 Channels
- Supports SPRTs, PRTs, Thermistors and Thermocouples
- Universal Inputs for Flexibility

The millisKanner channel expander has eight input channels, and each can be configured individually for SPRT, PRT, Thermistor or Thermocouple input. This gives ultimate flexibility with no need for separate devices for resistance or thermocouple inputs. A maximum of four devices can be added to the milliK providing 33 sensor inputs as well as the 4 - 20mA Process Input.

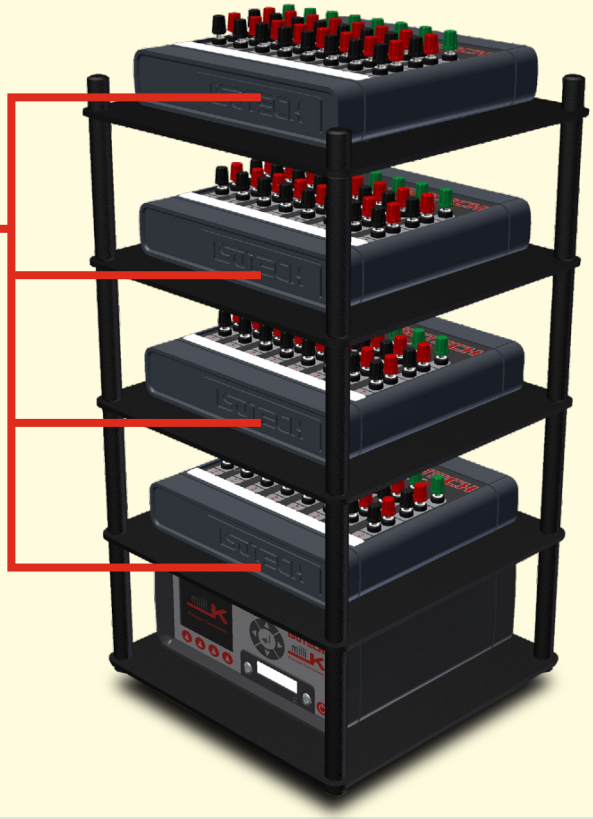
With no loss of accuracy and total flexibility a milliK system can be configured to suit a wide range of reference thermometers and units under test. This adaptable system saves on cost with no need for separate dedicated expansion modules and the flexibility maximises the usefulness of each channel.

A solid state design avoids mechanical relays and provides high reliability. The inputs are isolated with galvanic isolation between the contacts and the PSU and also from the control circuitry which allows for better measurements and lower noise.

The millisKanner is controlled from the milliK with plug and play operation.

For use as a standalone switch for PRTs, the device has UP / DOWN touch buttons or can be operated via RS232. The temperature of the input thermocouple connectors can be read directly over RS232 to facilitate reference junction compensation.

UP TO **x4** *expandable*



- Add up to 4 millisKanners
- Expand to a maximum of 33 Channels
- Same Accuracy - no loss in performance
- No Need for Multiple Modules - each channel can be selected for 3 or 4 Wire PRTs, SPRTs, Thermocouples or Thermistors

milliK specification

Input Channels	3	
Channels 1+2	SPRTs, PRTs, Thermistor and Thermocouples	
Channel 3	Process Inputs 4 - 20mA Isolated 24VDC Power Supply Included	
Ranges	SPRTs:	0-115Ω
	PRTs:	0-460Ω
	Thermistors:	0-500kΩ
	Thermocouples:	±115mV
	4-20mA:	0-30mA
Display Units	°C, °F, K, Ω, mV, mA	

Accuracy	Initial	Over 1 year
SPRTs/PRTs:	5ppm	7ppm
Thermistors:	50ppm	150ppm
Thermocouples:	2μV	4μV
4-20mA:	0.01%	0.02%

Temperature Accuracy	Initial	Over 1 year
SPRTs/PRTs (at 0°C):	3mK	4mK
(over full range):	5mK	7mK
Thermistors:	50ppm	150ppm

Thermocouples:	Ice Point Ref		Internal CJC	
	Initial	1 Year	Initial	1 Year
Type B @ 1000°C	±0.12°C	±0.14°C	±0.12°C	±0.14°C
Type E @ 600°C	±0.02°C	±0.05°C	±0.10°C	±0.20°C
Type J @ 600°C	±0.03°C	±0.05°C	±0.12°C	±0.23°C
Type K @ 600°C	±0.04°C	±0.06°C	±0.13°C	±0.25°C
Type L @ 600°C	±0.03°C	±0.05°C	±0.12°C	±0.23°C
Type N @ 600°C	±0.04°C	±0.06°C	±0.10°C	±0.19°C
Type R @ 1000°C	±0.09°C	±0.12°C	±0.14°C	±0.21°C
Type S @ 1000°C	±0.10°C	±0.14°C	±0.16°C	±0.24°C
Type T @ 200°C	±0.02°C	±0.03°C	±0.10°C	±0.18°C
Au-Pt @ 600°C	±0.06°C	±0.08°C	±0.10°C	±0.15°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. 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
Statistics	In Addition to Instantaneous Display user can select mean of 2 - 100 measurements with Standard Deviation	
Measurement Time	PRTs (4-wire): 0.4s (3-wire): 0.7s Thermistors: 0.4s Thermocouples (ice point): 0.4s (internal CJC): 0.7s (external CJC): 1.0s	
Cable Length	Limited to 10Ω per core and 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.

ISOTECH

About Us

The world leader in temperature metrology, with over 40 years' experience.

Our clients include the world's leading laboratories including National Laboratories, leading ISO 17025 Accredited Laboratories and users in all industries.

For more information: ISOTECH.CO.UK

UKAS Calibration Options ISO 17025

Why Choose Isotech?

> Innovation - winner of the Queen`s Award for Enterprise in the Innovation Category, 2017.

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION

> Isotech has solutions for all calibration needs, from Primary Laboratories maintaining National Standards to the needs of field engineers calibrating industrial sensors on site. Isotech is truly "The Source for Calibration Professionals".

> Global Network - local support. Isotech has over 90 authorized sales agents worldwide! No matter where you are, we can offer local support.

> The world's leading National Metrology Institutes choose Isotech - shouldn't you?

Temperature Metrology Solutions for:

> ITS-90 Primary Standards
> Industrial Sensor Calibration
> Secondary Temperature Calibration
> Infrared Thermometers
> High Accuracy Temperature Measurement
> Thermocouple Referencing Equipment

ISO 17025 calibration services to the smallest of uncertainties and with international recognition

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