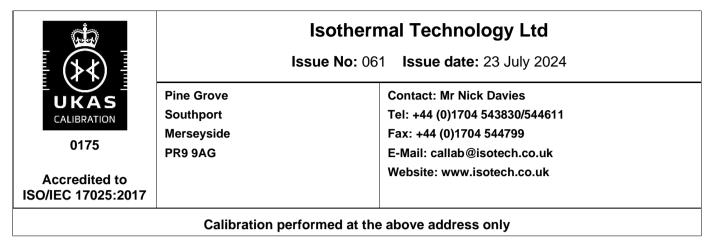
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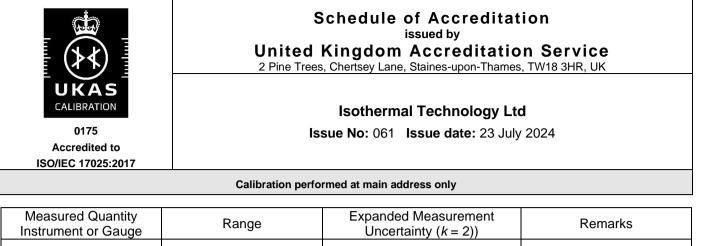


Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (<i>k</i> = 2)	Remarks
TEMPERATURE			Unless otherwise stated calibration by comparison with
Platinum resistance thermometers			reference instruments
Calibration by comparisons	-80 °C to -40 °C -40 °C to +50 °C 50 °C to 156 °C 156 °C to 300 °C 300 °C to 420 °C 420 °C to 660 °C	7.0 mK 4.0 mK 5.0 mK 6.5 mK 20 mK 35 mK	In a fluid bath or a fixed point cell bath
Calibration at fixed points See Note 1			Uncertainty in the determination of W(t ₉₀) used to calculate ITS-90 coefficients
BP Nitrogen (See Note 4) BP Nitrogen (See Note 5) TP Argon	-195.798 ℃ -195.798 ℃ -189.3442 ℃	2.0 mK 0.60 mK 0.50 mK 0.24 mK	
TP Mercury TP Water (See Note 3) MP Gallium FP Indium FP Tin	-38.8344 °C 0.01 °C 29.7646 °C 156.5985 °C 231.928 °C	0.24 mK 0.070 mK 0.15 mK 1.0 mK 1.0 mK	Note: TP = Triple Point FP = Freezing Point MP = Melting Point BP = Boiling Point
FP Zinc FP Aluminium FP Silver	419.527 °C 660.323 °C 961.78 °C	1.2 mK 2.0 mK 7.0 mK	Note 1: Suitable only for HT/SPRTs with high stability. Includes extrapolation to zero power and immersion checks.
See Note 2 BP Nitrogen TP Argon	-195.798 °C -189.3442 °C	5.0 mK 2.0 mK	Note 2: Suitable for most SPRTs using nominal current.
TP Mercury TP Water (See Note 3) MP Gallium	-38.8344 °C 0.01 °C 29.7646 °C	1.0 mK 0.50 mK 1.0 mK	Note 3: Determination of R(0.01°C)
FP Indium FP Tin FP Zinc	156.5985 °C 231.928 °C 419.527 °C	2.0 mK 2.5 mK 3.0 mK	Note 4: measured in a comparator
FP Aluminium FP Silver	660.323 °C 961.78 °C	6.0 mK 10 mK	Note 5: measured at TP Argon and extrapolated according to Euromet Technical Guide 1

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UKAS CALIBRATION 0175 Accredited to	Isothermal Technology Ltd Issue No: 061 Issue date: 23 July 2024				
ISO/IEC 17025:2017					
Calibration performed at main address only					
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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (<i>k</i> = 2)	Remarks
TEMPERATURE (cont'd)			
Fixed point cells			
See Note 6 TP Argon TP Mercury TP Water MP Gallium FP Indium FP Tin FP Zinc FP Aluminium FP Silver	-189.3442 °C -38.8344 °C 0.01 °C 29.7646 °C 156.5985 °C 231.928 °C 419.527 °C 660.323 °C 961.78 °C	0.80 mK 0.20 mK 0.070 mK 0.070 mK 0.40 mK 0.60 mK 0.90 mK 1.1 mK 2.0 mK	Note: TP = Triple Point FP = Freezing Point MP = Melting Point BP = Boiling Point Note 6: . Suitable for optimal realisations. Includes 3 melts, 3 freezes, 2 intercomparisons.
See Note 7 TP Mercury TP Water MP Gallium FP Indium FP Tin FP Zinc FP Aluminium FP Silver	-38.8344 °C 0.01 °C 29.7646 °C 156.5985 °C 231.928 °C 419.527 °C 660.323 °C 961.78 °C	1.0 mK 0.50 mK 1.0 mK 2.0 mK 2.0 mK 6.0 mK 10 mK	Note 7: Also appropriate for slim cells. Includes 1 melt, 1 freeze, 1 intercomparison sequence using a monitor SPRT.
Metal block calibrators and portable liquid baths	0 °C -80 °C to 0 °C 0 °C to 156 °C 156 °C to 300 °C 300 °C to 420 °C 420 °C to 660 °C 660 °C to 1100 °C 1100 °C to 1300 °C	10 mK 25 mK 20 mK 35 mK 50 mK 65 mK 1.0 °C 3.0 °C	Suitable for zero reference baths
Thermocouples			Thermocouples without a cold junction will have increased uncertainty
Platinum thermocouples			
Calibration by comparisons	-50 °C to 0 °C 0 °C to 50 °C 50 °C to 660 °C 660 °C to 1100 °C 1100 °C to 1300 °C	0.50 °C 0.45 °C 0.40 °C 0.70 °C 1.7 °C	In a fluid bath or a fixed point cell bath In a furnace
Other thermocouples	-196 °C -80 °C to 0 °C 0 °C to 50 °C 50 °C to 300 °C 300 °C to 420 °C 420 °C to 660 °C 660 °C to 1100 °C 1100 °C to 1300 °C	0.30 °C 0.25 °C 0.10 °C 0.25 °C 0.30 °C 0.40 °C 0.80 °C 2.2 °C	In liquid Nitrogen In a fluid bath or a fixed point cell bath In a furnace
Compensating and extension cables	-25 °C to +200 °C	1.0 °C	In a liquid bath



Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty $(k = 2)$	Remarks	
ELECTRICAL			Unless otherwise stated calibration by comparison with reference instruments	
DC VOLTAGE				
Specific Values	10 mV 20 mV 50 mV 100 mV 250 mV 500 mV 1 V 2 V	100 nV 150 nV 150 nV 200 nV 500 nV 1.0 μV 2.0 μV 3.0 μV		
Other values	0 mV to 140 mV 140 mV to 1.4 V	12 μV/V + 0.60 μV 12 μV/V + 1.3 μV		
DC RESISTANCE Measurement	0.1 Ω to 1 kΩ 1 kΩ to 100 kΩ	0.30 μΩ/Ω 12 μΩ/Ω	Resistors suitable for oil immersion can be measured over the range 20 °C to 23 °C	
Specific Values	1 Ω 5 Ω 10 Ω 25 Ω 100 Ω 400 Ω	0.080 μΩ/Ω 0.080 μΩ/Ω 0.075 μΩ/Ω 0.072 μΩ/Ω 0.072 μΩ/Ω 0.10 μΩ/Ω		
AC RESISTANCE	At 75 Hz: 0.1 Ω to 400 Ω 400 Ω to 1 kΩ	2.0 μΩ/Ω 2.2 μΩ/Ω	The uncertainties can only be realised for resistors with suitable AC characteristics	
DC RESISTANCE RATIO				
Resistance ratio	0.16 to 6.27	30 x 10 ⁻⁹	DC ratio bridge calibration using RBC 100A	
TEMPERATURE SIMULATION				
Temperature indicators and simulators, calibration by electrical simulation, for the following sensor types:				
Base metal thermocouple	-200 °C to +1600 °C	0.18 °C	including cold junction compensation	
Noble metal thermocouple	-200 °C to +1760 °C	0.22 °C	including cold junction compensation	
Resistance sensors (Pt100/Pt25)	-200 °C to +800 °C	0.0020 °C		
END				



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Isothermal Technology Ltd

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Accredited to ISO/IEC 17025:2017

Calibration performed at main address only

Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant nonrepeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of k = 2. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand. Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$