# Schedule of Accreditation

**issued by**

# United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

**0175**

**Accredited to ISO/IEC 17025:2017**

## Isothermal Technology Ltd

**Issue No:** 059 **Issue date:** 07 September 2022


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**Calibration performed at the above address only**

Calibration and Measurement Capability (CMC)

| Measured Quantity Instrument or Gauge | Range | Expanded Measurement Uncertainty ($k$ = 2) | Remarks |
|---|---|---|---|
| TEMPERATURE | | | Unless otherwise stated calibration by comparison with reference instruments |
| Platinum resistance thermometers | | | |
| Calibration by comparisons | -80 °C to -40 °C<br>-40 °C to +50 °C<br>50 °C to 156 °C<br>156 °C to 300 °C<br>300 °C to 420 °C<br>420 °C to 660 °C | 7.0 mK<br>4.0 mK<br>5.0 mK<br>6.5 mK<br>20 mK<br>35 mK | In a fluid bath<br>or a fixed point cell bath |
| Calibration at fixed points | | | Uncertainty in the determination of $W(t_{90})$ used to calculate ITS-90 coefficients |
| See Note 1 | | | |
| BP Nitrogen (See Note 4) | -195.798 °C | 2.0 mK | |
| BP Nitrogen (See Note 5) | -195.798 °C | 0.60 mK | |
| TP Argon | -189.3442 °C | 0.50 mK | |
| TP Mercury | -38.8344 °C | 0.24 mK | Note: TP = Triple Point |
| TP Water (See Note 3) | 0.01 °C | 0.070 mK | FP = Freezing Point |
| MP Gallium | 29.7646 °C | 0.15 mK | MP = Melting Point |
| FP Indium | 156.5985 °C | 1.0 mK | BP = Boiling Point |
| FP Tin | 231.928 °C | 1.0 mK | |
| FP Zinc | 419.527 °C | 1.2 mK | Note 1: Suitable only for HT/SPRTs with high stability. Includes extrapolation to zero power and immersion checks. |
| FP Aluminium | 660.323 °C | 2.0 mK | |
| FP Silver | 961.78 °C | 7.0 mK | |
| See Note 2 | | | Note 2: Suitable for most SPRTs using nominal current. |
| BP Nitrogen | -195.798 °C | 5.0 mK | |
| TP Argon | -189.3442 °C | 2.0 mK | |
| TP Mercury | -38.8344 °C | 1.0 mK | Note 3: Determination of R(0.01°C) |
| TP Water (See Note 3) | 0.01 °C | 0.50 mK | |
| MP Gallium | 29.7646 °C | 1.0 mK | |
| FP Indium | 156.5985 °C | 2.0 mK | Note 4: measured in a comparator |
| FP Tin | 231.928 °C | 3.0 mK | |
| FP Zinc | 419.527 °C | 3.5 mK | |
| FP Aluminium | 660.323 °C | 6.0 mK | Note 5: measured at TP Argon and extrapolated according to Euromet Technical Guide 1 |
| FP Silver | 961.78 °C | 40 mK | |

| Measured Quantity Instrument or Gauge | Range | Expanded Measurement Uncertainty ($k$ = 2) | Remarks |
|---|---|---|---|
| TEMPERATURE (cont'd) | | | |
| Fixed point cells | | | |
| See Note 6 | | | |
| TP Argon | -189.3442 °C | 0.80 mK | |
| TP Mercury | -38.8344 °C | 0.20 mK | Note: TP = Triple Point |
| TP Water | 0.01 °C | 0.070 mK | FP = Freezing Point |
| MP Gallium | 29.7646 °C | 0.070 mK | MP = Melting Point |
| FP Indium | 156.5985 °C | 0.65 mK | BP = Boiling Point |
| FP Tin | 231.928 °C | 0.60 mK | |
| FP Zinc | 419.527 °C | 0.90 mK | Note 6: . Suitable for optimal |
| FP Aluminium | 660.323 °C | 1.1 mK | realisations. Includes 3 melts, |
| FP Silver | 961.78 °C | 2.0 mK | 3 freezes, 2 intercomparisons. |
| See Note 7 | | | Note 7: Also appropriate for slim |
| TP Mercury | -38.8344 °C | 1.0 mK | cells. Includes 1 melt, 1 freeze, |
| TP Water | 0.01 °C | 0.50 mK | 1 intercomparison sequence |
| MP Gallium | 29.7646 °C | 1.0 mK | using a monitor SPRT. |
| FP Indium | 156.5985 °C | 2.0 mK | |
| FP Tin | 231.928 °C | 2.0 mK | |
| FP Zinc | 419.527 °C | 2.0 mK | |
| FP Aluminium | 660.323 °C | 6.0 mK | |
| FP Silver | 961.78 °C | 15 mK | |
| Metal block calibrators and portable liquid baths | 0 °C | 10 mK | Suitable for zero reference baths |
| | -80 °C to 0 °C | 25 mK | |
| | 0 °C to 156 °C | 20 mK | |
| | 156 °C to 300 °C | 35 mK | |
| | 300 °C to 420 °C | 50 mK | |
| | 420 °C to 660 °C | 65 mK | |
| | 660 °C to 1100 °C | 1.0 °C | |
| | 1100 °C to 1300 °C | 3.0 °C | |
| Thermocouples | | | Thermocouples without a cold junction will have increased uncertainty |
| Platinum thermocouples | | | |
| Calibration by comparisons | -50 °C to 0 °C | 0.50 °C | In a fluid bath |
| | 0 °C to 50 °C | 0.45 °C | or a fixed point cell bath |
| | 50 °C to 660 °C | 0.40 °C | |
| | 660 °C to 1100 °C | 0.70 °C | In a furnace |
| | 1100 °C to 1300 °C | 1.7 °C | |
| Other thermocouples | -196 °C | 0.30 °C | In liquid Nitrogen |
| | -80 °C to 0 °C | 0.25 °C | In a fluid bath |
| | 0 °C to 50 °C | 0.10 °C | or a fixed point cell bath |
| | 50 °C to 300 °C | 0.25 °C | |
| | 300 °C to 420 °C | 0.30 °C | |
| | 420 °C to 660 °C | 0.40 °C | |
| | 660 °C to 1100 °C | 0.80 °C | In a furnace |
| | 1100 °C to 1300 °C | 2.2 °C | |
| Compensating and extension cables | -25 °C to +200 °C | 1.0 °C | In a liquid bath |

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**Calibration performed at main address only**

| 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<br>20 mV<br>50 mV<br>100 mV<br>250 mV<br>500 mV<br>1 V<br>2 V | 0.22 μV<br>0.25 μV<br>0.35 μV<br>0.50 μV<br>1.0 μV<br>1.4 μV<br>4.0 μV<br>5.5 μV | |
| Other values | 0 mV to 140 mV<br>140 mV to 1.4 V | 12 μV/V + 0.60 μV<br>12 μV/V + 1.3 μV | |
| DC RESISTANCE<br>Measurement | 0.1 Ω to 1 kΩ<br>1 kΩ to 100 kΩ | 0.30 μΩ/Ω<br>12 μΩ/Ω | Resistors suitable for oil immersion can be measured over the range 20 °C to 23 °C |
| Specific Values | 1 Ω<br>5 Ω<br>10 Ω<br>25 Ω<br>100 Ω<br>400 Ω | 0.080 μΩ/Ω<br>0.080 μΩ/Ω<br>0.075 μΩ/Ω<br>0.072 μΩ/Ω<br>0.072 μΩ/Ω<br>0.10 μΩ/Ω | |
| AC RESISTANCE | *At 75 Hz:*<br>0.1 Ω to 400 Ω<br>400 Ω to 1 kΩ | <br>2.0 μΩ/Ω<br>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 nΩ/Ω | 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 | 0.31 °C | including cold junction compensation |
| Noble metal thermocouple | -200 °C to +1760 °C | 0.40 °C | including cold junction compensation |
| Resistance sensors (Pt100) | -200 °C to +800 °C | 0.0020 °C | |

END

## 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 non-repeatability) 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: $Q[a, b] = [a^2 + b^2]^{1/2}$