


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>9116</p> <p>Accredited to ISO/IEC 17025:2017</p>	<p align="center">Alpha Calibration Services Limited</p> <p align="center">Issue No: 011 Issue date: 04 August 2023</p>	
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<p align="center">Calibration performed at the above address only</p>		

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
ELECTRICAL CALIBRATION			
DC Voltage			Calibrations are performed as a direct comparison against a reference standard unless otherwise stated
Generation	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1 kV	58 $\mu\text{V/V} + 5.0 \mu\text{V}$ 58 $\mu\text{V/V} + 40 \mu\text{V}$ 58 $\mu\text{V/V} + 350 \mu\text{V}$ 58 $\mu\text{V/V} + 3.5 \text{ mV}$ 58 $\mu\text{V/V} + 23 \text{ mV}$	Source values for the calibration of voltmeters
Measurement	0 mV to 120 mV 120 mV to 1.2 V 1.2 V to 12.0 V 12.0 V to 12.00 V 12.00 V to 1050 kV	7.0 $\mu\text{V/V} + 2.0 \mu\text{V}$ 5.0 $\mu\text{V/V} + 7.0 \mu\text{V}$ 5.0 $\mu\text{V/V} + 45 \mu\text{V}$ 7.5 $\mu\text{V/V} + 0.70 \text{ mV}$ 7.5 $\mu\text{V/V} + 8.0 \text{ mV}$	Voltage sources can be calibrated to these uncertainties
DC Resistance Generation Specific Values	10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω	580 $\mu\Omega/\Omega$ 95 $\mu\Omega/\Omega$ 58 $\mu\Omega/\Omega$ 58 $\mu\Omega/\Omega$ 58 $\mu\Omega/\Omega$ 120 $\mu\Omega/\Omega$ 0.064 % 0.58 %	Source values for the calibration of ohmmeters
Measurement	0 Ω to 12 Ω 12 Ω to 120 Ω 120 Ω to 1.2 k Ω 1.2 k Ω to 12 k Ω 12 k Ω to 120 k Ω 120 k Ω to 1.2 M Ω 1.2 M Ω to 12 M Ω 12 M Ω to 120 M Ω	25 $\mu\Omega/\Omega + 0.35 \text{ m}\Omega$ 20 $\mu\Omega/\Omega + 2.0 \text{ m}\Omega$ 15 $\mu\Omega/\Omega + 9.0 \text{ m}\Omega$ 15 $\mu\Omega/\Omega + 85 \text{ m}\Omega$ 15 $\mu\Omega/\Omega + 1.5 \Omega$ 25 $\mu\Omega/\Omega + 20 \Omega$ 70 $\mu\Omega/\Omega + 500 \Omega$ 0.10 % + 15 k Ω	Resistance sources can be calibrated to these uncertainties



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ELECTRICAL CALIBRATION (cont'd)			
DC Current			
Generation	0 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 22 A 22 A to 1000 A	120 μ A/A + 23 nA 94 μ A/A + 92 nA 93 μ A/A + 1.0 μ A 110 μ A/A + 9.2 μ A 490 μ A/A + 100 μ A 410 μ A/A + 1.0 mA 0.77 % + 0.51 A	Ammeters can be calibrated to these uncertainties. Appropriate for the calibration of clampmeters
Measurement	0 to 120 μ A 120 μ A to 1.2 mA 1.2 mA to 12 mA 12 mA to 120 mA 120 mA to 1.05 A 1.05 A to 3 A 3 A to 22 A	30 μ A/A + 15 nA 30 μ A/A + 55 nA 30 μ A/A + 500 nA 50 μ A/A + 6.5 μ A 0.02 % + 150 μ A 0.14 % + 1.6 mA 0.055 %	Current sources can be calibrated to these uncertainties.
AC Voltage			
Generation	<i>10 Hz to 40 Hz</i> 10 mV to 200 mV 200 mV to 2 V 2 V to 20 V <i>40 Hz to 2 kHz</i> 10 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1 kV <i>2 kHz to 20 kHz</i> 10 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V <i>20 kHz to 100 kHz</i> 200 mV to 2 V 2 V to 20 V <i>2 kHz to 10 kHz</i> 200 V to 1 kV	0.065 % + 52 μ V 0.065 % + 330 μ V 0.062 % + 3.2 mV 0.037 % + 29 μ V 0.032 % + 250 μ V 0.031 % + 2.5 mV 0.040 % + 25 mV 0.037 % + 140 mV 0.10 % + 220 μ V 0.056 % + 0.45 mV 0.067 % + 4.5 mV 0.083 % + 45 mV 0.20 % + 3.5 mV 0.30 % + 35 mV 0.084 % + 340 mV	Source values for the calibration of voltmeters



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ELECTRICAL CALIBRATION (cont'd)			
Measurement	<p><i>1 Hz to 40 Hz</i> 1 V to 12 V</p> <p><i>10 Hz to 40 Hz</i> 10 mV to 100 mV 100 mV to 1 V 1 V to 10 V</p> <p><i>40 Hz to 1 kHz</i> 1 mV to 12 mV 12 mV to 120 mV 120 mV to 1.2 V 1.2 V to 12 V</p> <p><i>1 kHz to 20 kHz</i> 1 mV to 12 mV 12 mV to 120 mV 120 mV to 1.2 V 10 V to 100 V 100 V to 1 kV</p> <p><i>20 kHz to 50 kHz</i> 100 mV to 1 V 1 V to 10 V</p> <p><i>50 kHz to 100 kHz</i> 100 mV to 1 V 1 V to 10 V</p>	<p>0.070 % + 65 μV 0.070 % + 0.48 mV 0.070 % + 4.8 mV</p> <p>0.025 % + 8.0 μV 81 μV/V + 17 μV 81 μV/V + 70 μV 81 μV/V + 700 μV</p> <p>0.035 % + 8.0 μV 0.020 % + 17 μV 0.018 % + 70 μV 0.070 % + 35 mV 0.070 % + 0.46 V</p> <p>0.14 % + 0.47 mV 0.14 % + 4.7 mV</p> <p>0.70 % + 0.95 mV 0.70 % + 9.5 mV</p>	Voltage sources can be measured to these uncertainties.
AC Current			
Generation	<p><i>10 Hz to 45 Hz</i> 20 μA to 200 μA 200 μA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 22 A</p> <p><i>45 Hz to 2 kHz</i> 20 μA to 200 μA 200 μA to 2 mA 2 mA to 20 mA 20 mA to 202 mA</p> <p><i>2 kHz to 10 kHz</i> 20 μA to 200 μA 200 μA to 2 mA 2 mA to 20 mA 20 mA to 202 mA</p>	<p>0.15 % + 0.47 μA 0.095 % + 0.70 μA 0.15 % + 4.6 μA 0.089 % + 46 μA 0.10 % + 0.52 mA 0.23 % + 11 mA</p> <p>0.058 % + 0.35 μA 0.056 % + 0.46 μA 0.056 % + 3.5 μA 0.061 % + 35 μA</p> <p>0.16 % + 0.580 μA 0.13 % + 0.81 μA 0.14 % + 7.0 μA 0.13 % + 70 μA</p>	Ammeters can be calibrated to these uncertainties.



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ELECTRICAL CALIBRATION (cont'd)			
AC Current (cont'd)			
Generation (cont'd)	45 Hz to 1 kHz 200 mA to 2 A	0.075 % + 0.46 mA	
	1 kHz to 2 kHz 200 mA to 2 A	0.12 % + 0.46 mA	
	45 Hz to 200 Hz 2 A to 22 A	0.14 % + 7.0 mA	
	200 Hz to 1 kHz 2 A to 22 A	0.20 % + 9.3 mA	
	30 Hz to 60 Hz 22 A to 40 A 40 A to 200 A 200 A to 1000 A	0.79 % + 0.11 A 0.88 % + 0.15 A 0.77 % + 0.51 A	Appropriate for the calibration of clampmeters
Measurement	100 Hz to 5 kHz 10 μ A to 120 μ A 120 μ A to 1.2 mA 1.2 mA to 12 mA 12 mA to 120 mA 120 mA to 1.05 A	0.10 % + 80 nA 0.055 % + 600 nA 0.055 % + 5.0 μ A 0.055 % + 50 μ A 0.20 % + 0.8 mA	Outputs of current sources can be measured with these uncertainties
	10 Hz to 1 kHz 1 A to 3 A	0.17 % + 3.1 mA	
Frequency	1 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz	1.3 μ Hz/Hz + 0.16 μ Hz 1.3 μ Hz/Hz + 1.6 mHz 1.3 μ Hz/Hz + 16 mHz 1.3 μ Hz/Hz + 160 mHz 1.3 μ Hz/Hz + 1.6 Hz	
	10 MHz to 100 MHz 100 MHz to 1 GHz	2.3 μ Hz/Hz + 16 Hz 2.3 μ Hz/Hz + 16 Hz	
Tachometer Calibration Optical	60 RPM to 3000 RPM 3000 RPM to 30000 RPM 30000 RPM to 60000 RPM	0.005 % + 0.2 RPM 0.005 % + 2.2 RPM 0.005 % + 3.6 RPM	
Capacitance			
Generation	1 kHz 10 nF 20 nF 50 nF 100 nF 1 μ F	0.60 % 0.61 % 0.60 % 0.60 % 0.89 %	Output of capacitance for the calibration of capacitance bridges, meters etc.



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ELECTRICAL SIMULATION OF TEMPERATURE Calibration of thermocouple indicators Thermocouple type Type K Type T Type J	 -100 °C to +120 °C 120 °C to 1000 °C 1000 °C to 1370 °C -100 °C to +120 °C 120 °C to 400 °C -100 °C to +120 °C 120 °C to 600 °C 600 °C to 1200 °C	 0.52 °C 0.56 °C 0.61 °C 0.50 °C 0.50 °C 0.51 °C 0.54 °C 0.59 °C	 Measurement capability and voltage output for the calibration of thermocouple indicators by simulation Including cold junction compensation
END			



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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: $Q[a, b] = [a^2 + b^2]^{1/2}$