


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>UKAS CALIBRATION</p> <p>23653</p> <p>Accredited to ISO/IEC 17025:2017</p>	<p>Thorcal Ltd</p> <p>Issue No: 001 Issue date: 25 April 2022</p>	
	<p>B6 Citadel Trading Park Hull HU9 1TQ</p>	<p>Contact: James Thompson Tel: +44 (0) 1482 242010 E-Mail: Info@thorcal.co.uk Website: www.thorcal.co.uk</p>
<p>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
<p>PRESSURE</p> <p>Hydraulic pressure (gauge) Calibration of pressure indicating instruments and gauges</p> <p><u>Gas pressure (gauge)</u> Calibration of pressure indicating instruments and gauges</p>	<p>690 kPa to 110 MPa</p> <p>-100 kPa to -6.9 kPa 1.5 kPa to 6.8 kPa 6.8 kPa to 740 kPa</p>	<p>0.011 %</p> <p>0.010 % 0.011 % 0.0082 %</p>	<p>Methods consistent with EURAMET CG17</p> <p>Calibration of pressure measuring devices with an electrical output may be undertaken.</p> <p>Absolute pressure calibrations may be undertaken by associated barometric pressure measurement with an additional uncertainty of ± 36 Pa</p>
<p>TEMPERATURE</p> <p>Temperature indicators and or recorders with temperature sensors</p> <p>Metal Block Calibrators</p>	<p>-39 °C to 0 °C 0 °C to 75 °C 75 °C to 232 °C 232 °C to 420 °C 420 °C to 660 °C</p> <p>-90 °C to 0 °C 0 °C to 125 °C 125 °C to 660 °C</p>	<p>0.13 °C 0.12 °C 0.24 °C 0.28 °C 0.42 °C</p> <p>0.040 °C 0.030 °C 0.030 °C</p>	<p>Comparison to a reference standard in a metal block</p> <p>Comparison to a reference PRT. Characterisation consistent with Euramet CG 13,</p>



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
ELECTRICAL			All electrical calibrations are performed as a comparison against a reference standard
DC VOLTAGE			
Generation	0 V to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1050 V	46 μ V/V + 2.1 μ V 46 μ V/V + 31 μ V 46 μ V/V + 310 μ V 47 μ V/V + 3.7 mV 69 μ V/V + 35 mV	For the calibration of measuring instruments
Measurement	0 to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	59 μ V/V + 4.1 μ V 36 μ V/V + 8.2 μ V 36 μ V/V + 59 μ V 54 μ V/V + 710 μ V 54 μ V/V + 7.0 mV	For instruments with a voltage output
DC CURRENT			
Generation	0 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 20 A	0.018 % + 30 nA 0.014 % + 87 nA 0.014 % + 640 nA 0.014 % + 11 μ A 0.046 % + 200 μ A 0.070 % + 10 mA	For the calibration of measuring instruments
Measurement	0 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.059 % + 0.93 μ A 0.059 % + 92 μ A 0.095 % + 93 μ A 0.15 % + 0.43 mA	For instruments with a resistance output
AC VOLTAGE			
Generation	<u>1 mV to 200 mV</u> 40 Hz to 1 kHz 1 kHz to 20 kHz	0.058% + 0.12 mV 0.12 % + 0.18 mV	For the calibration of measuring instruments
	<u>0.2 V to 2 V</u> 40 Hz to 1 kHz 1 kHz to 20 kHz	0.046 % + 0.33 mV 0.069 % + 0.60 mV	
	<u>2 V to 20 V</u> 40 Hz to 1 kHz 1 kHz to 20 kHz	23 mV 21mV	
	<u>20 V to 200 V</u> 40 Hz to 1 kHz	0.077% + 42 mV	
	<u>200 V to 1000 V</u> 40 Hz to 1 kHz	0.10 % + 14 mV	



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AC VOLTAGE			
Measurement	0 mV to 100 mV 40 Hz to 20 kHz 20 kHz to 50 kHz	0.075 % + 7.3 μ V 0.14 % + 7.3 μ V	For instruments with a voltage output
	100 mV to 1 V 40 Hz to 20 kHz 20 kHz to 50 kHz	0.072 % + 5.8 mV 0.14 % + 5.8 mV	
	1 V to 10 V 40 Hz to 20 kHz 20 kHz to 50 kHz	0.074 % + 6.7 mV 0.14 % + 8.2 mV	
	10 V to 100 V 40 Hz to 20 kHz 20 kHz to 50 kHz	0.078 % + 6.0 mV 0.14 % + 6.0 mV	
	100 V to 750 V 40 Hz to 15 kHz	0.075 % + 0.26 V	
AC CURRENT			
Generation	<u>0 A to 200 μA</u> 40 Hz to 1 kHz	0.081 % + 0.37 μ A	For the calibration of measuring instruments
	<u>200 μA to 2 mA</u> 40 Hz to 1 kHz	0.11 % + 0.88 μ A	
	<u>2 mA to 20 mA</u> 40 Hz to 1 kHz	0.081 % + 8.7 μ A	
	<u>20 mA to 200 mA</u> 40 Hz to 1 kHz	0.092 % + 87 μ A	
	<u>200 mA to 2 A</u> 40 Hz to 500 Hz	0.12 % + 1.6 mA	
	<u>2 A to 20 A</u> 40 Hz to 500 Hz	0.23 % + 7.1 mA	
Measurement	<u>0 A to 1 A</u> 40 Hz to 1 kHz	0.38 % + 2.3 mA	For instruments which generate current
	<u>1 A to 3 A</u> 40 Hz to 1 kHz	13 mA	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
DC RESISTANCE			
FIXED RESISTANCE 2 WIRE			
Generation	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ	13 mΩ 17 mΩ 79 mΩ 0.79 Ω 7.9 Ω 0.18 kΩ 12 kΩ 1.2 MΩ 110 MΩ	For the calibration of measuring instruments
Measurement	0 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ	0.014 % + 3.7 mΩ 0.019 % + 12 mΩ 0.013 % + 0.12 Ω 0.013 % + 1.2 Ω 0.013 % + 120 Ω 0.098% + 1.2 kΩ 0.18 % + 3.5 kΩ	
SIMULATED RESISTANCE (2 WIRE)	0 Ω to 400 Ω 400 Ω to 1000 Ω 1000 Ω to 10 kΩ	0.058 % + 0.58 Ω 0.027 % + 1.2 Ω 0.023 % + 0.10 kΩ	For the calibration of measuring instruments
Temperature indicators, calibration by electrical simulation			
Type k thermocouple	-200 °C to 0 °C 0 °C to 1372 °C	0.70 °C 0.70 °C	
18th EDITION ELECTRICAL TEST EQUIPMENT			
CONTINUITY RESISTANCE	0 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 kΩ	0.29 % + 31 mΩ 0.29 % + 31 mΩ 0.29 % + 31 mΩ 0.29 % + 31 mΩ	For the calibration of Insulation Resistance Meters using a dedicated calibration system
CONTINUITY CURRENT	10 mA to 320 mA	1.5 % + 0.7 mA	
INSULATION RESISTANCE	10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ 1 GΩ to 10 GΩ	0.12 % + 0.20 Ω 0.12 % 1.2 % 1.2 % 1.4 % 6.5 %	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
18th EDITION ELECTRICAL TEST EQUIPMENT (continued)			
INSULATION TEST VOLTAGE	50 V to 1000 V	1.2 % + 0.93 V	
AC VOLTAGE OUTPUT	100 V to 200 V 200 V to 400 V At 50 Hz	0.23 % + 0.16 V 0.23 % + 0.15 V	
RCD CURRENT	At 50 Hz <u>20 ms to 190 ms</u> 2 mA to 1 A 1 A to 3 A	5.8 % + 0.23 mA 5.8 % + 0.23 mA	For the calibration of RCD Testers using a dedicated calibration system
	<u>190 ms to 5 s</u> 2 mA to 1 A 1 A to 3 A	1.4 % + 71 uA 1.4 % + 71 uA	
TRIP TIME	20 ms to 400 ms 400 ms to 5 s	0.95 ms 8.1 ms	
LOOP RESISTANCE	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω At 50 Hz	0.58 % + 41 m Ω 0.58 % + 45 m Ω 0.58 % + 54 m Ω	For the calibration of Earth Loop Testers using a dedicated calibration system
PAT TESTERS			
PAT EARTH BOND RESISTANCE at 50 Hz	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1000 Ω	0.58 % + 4.7 m Ω 0.58 % + 19 m Ω 0.58 % + 35 m Ω	For the calibration of Portable Appliance Testers using a dedicated calibration system
PAT EARTH BOND CURRENT at 50 Hz	0 mA to 500 mA 500 mA to 10 A 10 A to 30 A	1.7 % + 14 mA 1.7 % + 71 mA 1.7 % + 71 mA	
PAT INSULATION RESISTANCE at 50 Hz	10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω 1 G Ω to 10 G Ω	0.12 % + 0.20 Ω 0.12 1.2 % 1.2 % 1.4 % 6.5 %	
PAT LEAKAGE CURRENT at 50 Hz	2.7 mA at 240 V 4.7 mA at 240 V 7.7 mA at 240 V	1.7 % + 9.6 μ A 1.7 % + 9.6 μ A 1.7 % + 9.6 μ A	
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: $Q[a, b] = [a^2 + b^2]^{1/2}$