Schedule of Accreditation

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Accredited to ISO/IEC 17025:2017

Cuthbertson & Laird Instruments Ltd, Trading as Cuthbertson Laird Group

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Calibration performed by the Organisations at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details	Activity	Location code
Address Parkburn Court Burnbank Hamilton Scotland ML3 0QQ **Local contact** Mr P Greenshields	Dimensional and Electrical	A

Site activities performed away from the locations listed above:

Location details	Activity	Location code
At customer's premises The customer's site or premises must be suitable for the nature of the particular calibrations undertaken and will be the subject of contract review arrangements between the laboratory and the customer.	Dimensional	B

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DIMENSIONAL CALIBRATIONS	RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED			
LENGTH			NOTES 1 All linear calibrations may be given in inch units.	
Plain Plug Gauges (Parallel)	1 to 50 diameter 50 to 100 100 to 200 200 to 300	0.80 1.5 2.0 3.0 on diameter.	Comparison to gauge blocks using a length measuring machine.	A
Length Gauges, Flat and Spherical Ended (excluding Length Bars)	25 to 1000	1.0 + (8.0 x length in m)	Comparison to gauge blocks using a length measuring machine.	A
ANGLE			2 The uncertainty quoted is for the departure from flatness, straightness, parallelism or squareness, i.e., the distance separating the two parallel planes which just enclose the surface under consideration.	
Squares Blade Type	50 to 300 300 to 450	3.0 on squareness 5.0 *See* Note 2	BS 939:2007 Comparison to master square.	A
MEASURING INSTRUMENTS AND MACHINES				
Micrometers			Comparison to length standards	
External	0 to 1000	Heads 2.0 between any two points	BS 870:2008	A
Internal Micrometers	0 to 900	Setting and extension rods 1.0 + (8.0 x length in m)	BS 959:2008	A
Depth Micrometers	0 to 300		BS 6468:2008	A
Vernier, dial and digital type gauges			Comparison to length standards.	A
Calliper	0 to 1000	Overall performance 10 + (30 x length in m)	As BS 887:2008	
Height	0 to 1000	Overall performance 10 + (10 x length in m)	ISO13225:2012 and BS 1643:2008	
Depth	0 to 600	Overall performance 10 + (30 x length in m)	As BS 6365:2008	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
MEASURING INSTRUMENTS AND MACHINES (continued)				
Dial Gauges and Dial Test Indicators	0 to 50	1.0	BS 907:2008 and BS 2795:1981 using a length measuring machine.	A
Surface Plates Granite Cast Iron	160 x 100 to 4000 x 4000 Flatness of working surface: Local variation of working surface:	 1.5 + (0.80 x diagonal in m) See Note 2 2.7	BS 817:2008 and above using an electronic level and variation gauge.	A and B
Feeler Gauges	0.025 to 1.0	2.0	BS 957:2008 using a length measuring machine.	A
ELECTRICAL CALIBRATIONS				
DC RESISTANCE Specific values				A
Measurement	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ 1 T Ω	14 μΩ/Ω 9.6 μΩ/Ω 8.0 μΩ/Ω 8.8 μΩ/Ω 9.6 μΩ/Ω 24 μΩ/Ω 110 μΩ/Ω 440 μΩ/Ω 0.40 % 0.59 % 2.0 % 1.4 %	Using digital multimeter.	
Other values Measurement	0 Ω to 1 Ω 1 Ω to 10 Ω 10 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 100 MΩ to 1 GΩ	 41 μΩ/Ω 41 μΩ/Ω 40 μΩ/Ω 10 μΩ/Ω 10 μΩ/Ω 10 μΩ/Ω 29 μΩ/Ω 130 μΩ/Ω 450 μΩ/Ω 0.40 %	Using digital multimeter.	A

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DC RESISTANCE (continued)				A
Generation			Using multifunction calibrator or decade resistance box.	
Specific values	10 Ω	420 μΩ		
	100 Ω	7.2 mΩ		
	1 kΩ	20 mΩ		
	10 kΩ	190 mΩ		
	100 kΩ	2.3 Ω		
	1 MΩ	39 Ω		
	10 MΩ	1.4 kΩ		
	100 MΩ	47 kΩ		
DC VOLTAGE				A
Measurement				
Specific values	100 mV	11 μV/V	Using digital multimeter.	
	1 V	9.4 μV/V		
	10 V	9.4 μV/V		
	100 V	12 μV/V		
	1000 V	12 μV/V		
Other values	0 mV to 100 mV	2.5 μV	Using digital multimeter.	
	100 mV to 1 V	10 μV/V		
	1 V to 10 V	9.5 μV/V		
	10 V to 100 V	12 μV/V		
	100 V to 1000 V	12 μV/V		
	1 kV to 20 kV	1.3 %	Using high voltage divider.	
	20 kV to 38 kV	1.2 %		
Generation	0 mV to 220 mV	10 μV/V + 9.0 μV	Using multifunction calibrator.	
	220 mV to 2.2 V	13 μV/V + 1.4 μV		
	2.2 V to 11 V	15 μV/V + 4.6 μV		
	11 V to 22 V	15 μV/V + 9.2 μV		
	22 V to 220 V	18 μV/V + 0.12 mV		
	220 V to 1000 V	18 μV/V + 0.69 mV		
DC CURRENT				A
Measurement				
Specific values	1 μA	45 μA/A	Using digital multimeter.	
	10 μA	25 μA/A		
	100 μA	24 μA/A		
	1 mA	24 μA/A		
	10 mA	24 μA/A		
	100 mA	41 μA/A		
	1 A	87 μA/A		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DC CURRENT (continued)				A
Measurement (continued)				
Other values	0 μA to 1 μA	320 pA	Using digital multimeter.	
	1 μA to 10 μA	82 μA/A		
	10 μA to 100 μA	67 μA/A		
	100 μA to 1 mA	46 μA/A		
	1 mA to 10 mA	46 μA/A		
	10 mA to 100 mA	57 μA/A		
	100 mA to 1 A	120 μA/A		
Generation	0 μA to 220 μA	110 μA/A + 12 nA	Using multifunction calibrator.	A
	220 μA to 2.2 mA	83 μA/A + 12 nA		
	2.2 mA to 22 mA	19 μA/A + 12 nA		
	22 mA to 220 mA	140 μA/A + 12 nA		
	220 mA to 2.2 A	180 μA/A + 120 nA		
	2.2 A to 11 A	0.10 %		
	11 A to 200 A	200 μA/A + 0.16 A	For the calibration of clamp on ammeters and similar devices, using multi-turn method.	
	200 to 550 A	0.10 % + 0.50 A		
	550 to 1000 A	0.10 % + 0.85 A		
AC VOLTAGE				A
Measurement			Using digital multimeter.	
Specific values	*At 1 kHz*			
	10 mV	190 μV/V		
	100 mV	73 μV/V		
	40 Hz to 1 kHz			
	1 V	64 μV/V		
	10 V	65 μV/V		
	100 V	160 μV/V		
	700 V	310 μV/V		
	1 kHz to 100 kHz			
	1 V	620 μV/V		
	10 V	620 μV/V		
	100 V	930 μV/V		
Other values	*At 1 kHz*		Using digital multimeter.	A
	1 mV to 10 mV	0.090 %		
	10 mV to 100 mV	0.020 %		
	100 mV to 1 V	0.020 %		
	40 Hz to 1 kHz			
	1 V to 10 V	0.020 %		
	10 V to 100 V	0.022 %		
	100 V to 700 V	0.035 %		
	700 V to 1 kV	0.23 %		
	1 kHz to 100 kHz			
	100 mV to 1 V	0.064 %		
	1 V to 10 V	0.064 %		
	10 V to 100 V	0.10 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC VOLTAGE (continued)				A
Measurement (continued)	*At 50 Hz*			
	1 kV to 20 kV	2.1 %	Using high voltage divider.	
	20 kV to 28 kV	3.0 %		
Generation	*At 1 kHz*			
	22 µV to 2.2 mV	0.090 % + 5.8 µV	Using multifunction calibrator.	
	2.2 mV to 22 mV	0.024 % + 7.0 µV		
	22 mV to 220 mV	0.027 % + 12 µV		
	40 Hz to 20 kHz			
	220 mV to 2.2 V	0.022 % + 8.0 µV		
	2.2 V to 22 V	0.024 % + 81 µV		
	22 V to 220 V	0.036 % + 1.2 mV		
	220 V to 700 V	0.23 % + 11 mV		
AC CURRENT				A
Measurement Specific Values	*At 1 kHz*		Using digital multimeter.	
	100 µA	0.056 %		
	1 mA	0.051 %		
	45 Hz to 1 kHz			
	10 mA	0.050 %		
	100 mA	0.050 %		
	1 A	0.080 %		
Other values	*At 1 kHz*		Using digital multimeter.	
	5 µA to 100 µA	0.24 %		
	100 µA to 1 mA	0.16 %		
	45 Hz to 1 kHz			
	1 mA to 10 mA	0.16 %		
	10 mA to 100 mA	0.16 %		
	100 mA to 1 A	0.18 %		
Generation	*At 1 kHz*			
	9 µA to 220 µA	0.18 % + 23 nA	Using multifunction calibrator.	
	220 µA to 2.2 mA	0.16 % + 47 nA		
	45 Hz to 1 kHz			
	2.2 mA to 22 mA	0.16 % + 1.0 µA		
	22 mA to 220 mA	0.18 % + 4.6 µA		
	220 mA to 2.2 A	0.16 % + 46 µA		
	1 A to 2.2 A	0.13 %		
	2.2 A to 11 A	0.90 %		
	11 A to 200 A	0.60 A	For the calibration of clamp on ammeters and similar devices, using multi-turn method.	
	200 A to 550 A	1.7 A		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
FREQUENCY				A
	1 Hz to 1 MHz	21 in 10^8 + 2.0 mHz	Using frequency counter.	A
	1 MHz to 2.1 GHz	21 in 10^8		
Tachometer calibration	10 rpm to 50000 rpm	1.2 rpm	Using optical technique.	
Elapsed time	0 ms to 390 ms	1.0 ms	Using counter timer.	A
	391 ms to 100 s	8.0 ms		
17TH EDITION TYPE EQUIPMENT				A
Earth Loop	0.05 Ω	10 mΩ	Using dedicated calibrator.	
	0.1 Ω	11 mΩ		
	0.22 Ω	8.0 mΩ		
	0.33 Ω	8.0 mΩ		
	0.5 Ω	8.0 mΩ		
	1 Ω	10 mΩ		
	5 Ω	30 mΩ		
	10 Ω	59 mΩ		
	100 Ω	580 mΩ		
	1 kΩ	5.8 mΩ		
RCD testers				A
Trip current	*At 50 Hz*			
	3 mA to 10 mA	620 µA	Up to 5 seconds.	
	10 mA to 100 mA	5.8 mA		
	100 mA to 1 A	59 mA		
	1 A to 3 A	120 mA		
Trip Time	*At 30 mA, 50 Hz*			
	10 ms to 390 ms	1.0 ms		
	390 ms to 1 s	8.1 ms		
Earth leakage current	0.2 mA to 7.7 mA	15 µA		A
PAT Testers				
Earth bond current	*At 50 Hz*			
	100 mA	8.0 mA		A
	100 mA to 10 A	190 mA		
	10 A to 30 A	520 mA		
Earth Bond resistance				A
Nominal values	0.05 Ω	7.5 mΩ		
	0.1 Ω	7.5 mΩ		
	0.22 Ω	7.6 mΩ		
	0.33 Ω	7.7 mΩ		
	0.5 Ω	8.0 mΩ		
	1 Ω	9.5 mΩ		
	5 Ω	30 mΩ		
	10 Ω	58 mΩ		
	100 Ω	580 mΩ		
	1 kΩ	5.8 Ω		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
17TH EDITION TYPE EQUIPMENT (continued)				A
Insulation resistance Nominal source values	100 kΩ 500 kΩ 1 MΩ 5 MΩ 10 MΩ 20 MΩ 50 MΩ 100 MΩ	12 kΩ 12 kΩ 12 kΩ 21 kΩ 37 kΩ 72 kΩ 180 kΩ 350 kΩ		
Load Tests	3 kVA	2.5 %		A
Flash tests	*At 50 Hz* 700 V to 1.9 kV	1.5 % + 5.0 V		
ELECTRICAL SIMULATION OF TEMPERATURE				A
Ambient temperature	17 °C to 23 °C	0.11 °C	In support of cold junction measurements.	
Temperature simulators and indicators, calibration by electrical simulation				
Base metal thermocouples	-200 °C to -100 °C	0.47 °C	Excluding cold junction compensation.	
	0 °C to +1370 °C	0.36 °C	Excluding cold junction compensation.	
	-200 °C to -100 °C	0.47 °C	Including cold junction compensation.	
	-100 °C to +1300 °C	0.38 °C	Including cold junction compensation.	
Noble metal thermocouples	0 °C to 1700 °C	1.8 °C	Excluding cold junction compensation.	
	0 °C to 1700 °C	1.8 °C	Including cold junction compensation.	

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