Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

0164

Accredited to ISO/IEC 17025:2017

Industrial Calibration Ltd

Issue No: 037 **Issue date:** 23 May 2025

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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
DC RESISTANCE			
Measurement and generation			
	0 Ω to 20 Ω	30 μΩ/Ω	Measurement of resistance values using digital multimeter and application of known values to resistance measuring instruments.
	20 Ω to 200 Ω	14 μΩ/Ω	
	200 Ω to 2 kΩ	12 μΩ/Ω	
	2 kΩ to 20 kΩ	12 μΩ/Ω	
	20 kΩ to 200 kΩ	12 μΩ/Ω	
	200 kΩ to 2 MΩ	20 μΩ/Ω	
	2 MΩ to 20 MΩ	60 μΩ/Ω	
	20 MΩ to 200 MΩ	0.065 %	
	200 MΩ to 2 GΩ	0.65 %	
Generation only			
4-wire values	10 Ω	24 μΩ/Ω	Application of known resistance values to resistance measuring equipment, with two-wire or four-wire configurations as indicated.
	100 Ω	16 μΩ/Ω	
	1 kΩ	12 μΩ/Ω	
	10 kΩ	15 μΩ/Ω	
	100 kΩ	15 μΩ/Ω	
	1 MΩ	20 μΩ/Ω	
	10 MΩ	37 μΩ/Ω	
	100 MΩ	100 μΩ/Ω	
2-wire values	10 Ω	950 μΩ/Ω	
	100 Ω	120 μΩ/Ω	
	1 kΩ	15 μΩ/Ω	
	10 kΩ	17 μΩ/Ω	
	100 kΩ	20 μΩ/Ω	
	1 MΩ	35 μΩ/Ω	
	10 MΩ	70 μΩ/Ω	
	100 MΩ	100 μΩ/Ω	
Current carrying resistors			
Measurement and generation			
	At 10 A		Resistance measurement calculated using ohms law
	100 μΩ	0.16 %	
	1 mΩ	0.030 %	
	10 mΩ	0.020 %	
	At 1 A		
	100 mΩ	80 μΩ/Ω	
	1 Ω	70 μΩ/Ω	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
DC VOLTAGE			
Measurement	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	10 μV/V + 1.5 μV 10 μV/V 8.0 μV/V 12.0 μV/V 12 μV/V	Measurement of DC voltages by comparison with precision digital multimeter.
Generation	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	10 μV/V + 1.5 μV 11 μV/V 5.0 μV/V 7.0 μV/V 9.0 μV/V	Application of known DC voltages to voltage measuring equipment.
DC CURRENT			
Measurement and Generation			
Specific Values	10 μA 100 μA 1 mA 10 mA 100 mA 1 A	30 μA/A 30 μA/A 35 μA/A 40 μA/A 65 μA/A 90 μA/A	Using current shunts.
Other Values	0 nA to 10 nA 10 nA to 100 nA 100 nA to 1 μA 1 μA to 10 μA 10 μA to 200 μA 200 μA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2A to 10 A 10 A to 20 A 20 A to 50 A	17 pA 20 pA 35 pA 130 pA 35 μA/A + 1.50 nA 35 μA/A + 6.0 nA 35 μA/A + 60 nA 35 μA/A + 1.2 μA 40 μA/A + 25 μA 0.025 % 0.0450 % 0.050 %	Using multimeter (and current shunts above 2 A).
Generation only	0 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 10 A	30 μA/A + 3.0 nA 25 μA/A + 12 nA 25 μA/A + 120 nA 25 μA/A + 1.2 μA 40 μA/A + 25 μA 130 μA/A + 0.60 mA	Application of known DC currents to current measuring equipment.

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC VOLTAGE			
Measurement	*40 Hz to 10 kHz*		Measurement of AC voltage sources using digital multimeter.
	10 mV to 200 mV	0.016 % + 5.0 μV	
	200 mV to 2 V	0.016 %	
	2 V to 20 V	0.016 %	
	20 V to 200 V	0.016 %	
	200 V to 1000 V	0.025 %	
	10 kHz to 30 kHz		
	10 mV to 200 mV	0.030 % + 10 μV	
	200 mV to 2 V	0.030 %	
	2 V to 20 V	0.030 %	
	20 V to 200 V	0.030 %	
	30 kHz to 100 kHz		
	10 mV to 200 mV	0.05 % + 25.0 μV	
	200 mV to 2 V	0.031 % + 0.25 mV	
	2 V to 20 V	0.031 % + 2.5 mV	
	20 V to 200 V	0.031 % + 25 mV	
Generation	10 mV to 20 mV		Application of known AC voltages to voltage measuring equipment.
	40 Hz to 10 kHz	0.070 % + 6.5 μV	
	10 kHz to 100 kHz	0.095 % + 6.5 μV	
	100 kHz to 300 kHz	0.20 % + 14.0 μV	
	20 mV to 200 mV		
	40 Hz to 10 kHz	0.011 % + 11.0 μV	
	10 kHz to 100 kHz	0.040 % + 11.0 μV	
	100 kHz to 300 kHz	0.095 % + 24.0 μV	
	200 mV to 2 V		
	40 Hz to 10 kHz	0.014 %	
	10 kHz to 100 kHz	0.017 %	
	100 kHz to 300 kHz	0.062 %	
	2 V to 20 V		
	40 Hz to 10 kHz	0.014 %	
	10 kHz to 100 kHz	0.023 %	
	100 kHz to 300 kHz	0.069 %	
	20 V to 200 V		
	40 Hz to 10 kHz	0.014 %	
	10 kHz to 100 kHz	0.026 %	
	100 kHz to 300 kHz	0.31 %	
	200 V to 1000 V		
	40 Hz to 10 kHz	0.019 %	
	10 kHz to 100 kHz	0.045 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC CURRENT			
Measurement	*40 Hz to 1 kHz*		
	10 μA to 200 μA	0.027 % + 25 nA	By comparison with precision calibrator.
	200 μA to 2 mA	0.027 % + 0.25 μA	.
	2 mA to 20 mA	0.027 % + 2.5 μA	
	20 mA to 200 mA	0.027 % + 25 μA	
	200 mA to 2 A	0.043 % + 0.50 mA	
	2 A to 10 A	0.065 % + 4.0 mA	
	10 A to 30 A	0.065 % + 11 mA	
Generation	*40 Hz to 1 kHz*		
	10 μA to 200 μA	0.017 % + 12 nA	Using precision calibrator. 400 Hz maximum above 2 A.
	200 μA to 2 mA	0.017 % + 120 nA	
	2 mA to 20 mA	0.018 % + 1.2 μA	
	20 mA to 200 mA	0.017 % + 12 μA	
	200 mA to 2 A	0.032 % + 120 μA	
	2 A to 10 A	0.057 % + 1.5 mA	
FREQUENCY			Using counter and GPS receiver.
Measurement	1 mHz to 3 GHz	1.5 in 10^8	
Generation	450 Hz to 800 MHz	5.0 in 10^{10}	
RISETIME	1 ns to 20 ns	90 ps	For oscilloscope risetime calibration, using fast pulse generator. There may be additional uncertainties relating to the screen resolution of the oscilloscope being calibrated.
CAPACITANCE			Known values of capacitance for application to capacitance measuring devices.
Generation, specific values	*1 kHz*		
	100 pF	0.050 % + 0.10 pF	
	1 nF	0.050 % + 0.10 pF	
	10 nF	0.030 %	
	100 nF	0.030 %	
	1 μF	0.020 %	
Generation, other values	*1 kHz*		
	1 nF to 1 μF	0.050 % + 5.0 pF	
INDUCTANCE			
Generation, specific values	*1 kHz*		
	100 μH to 1 H in decade steps	0.020 % + 0.12 μH	

Measured Quantity Instrument or Gauge	Range		Expanded Measurement Uncertainty (k = 2)	Remarks
TEMPERATURE	20 ºC nominal		0.040 ºC	For verification of thermocouple indicators and simulators (including cold junction compensation) at ambient temperature.
Electrical calibration of temperature indicators				
Indicators for base metal thermocouples	Type	Range ºC		
	K	-100 to +1370	0.10 ºC	By millivolt injection without cold junction compensation. The cold junction will normally be the subject of a separate calibration.
	J	-100 to +1200	0.040 ºC	
	T	-100 to +400	0.070 ºC	
	E	-100 to +1000	0.050 ºC	
	N	- 50 to +1300	0.10 ºC	
Indicators for noble metal thermocouples	Type	Range ºC		
	R	+100 to +1750	0.350 ºC	By millivolt injection without cold junction compensation. The cold junction will normally be the subject of a separate calibration.
	S	+100 to +1750	0.350 ºC	
	B	+250 to +450	1.3 ºC	
	B	+450 to +1800	0.70 ºC	
Indicators for resistance thermometers	Type	Range ºC		
	PT100	-200 to +850	0.020 ºC	By resistance simulation.
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: $Q[a, b] = [a^2 + b^2]^{1/2}$