

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>0208 Accredited to ISO/IEC 17025:2017</p>	<h3>Scotia Instrumentation Ltd</h3> <p>Issue No: 054 Issue date: 09 October 2024</p>	
	<p>Campus 1 Aberdeen Science and Technology Park Balgownie Road Bridge of Don Aberdeen AB22 8GT</p>	<p>Contact: Mr Ross Benzie Tel: +44 (0)1224 222888 Fax: +44 (0)1224 826299 E-Mail: info@Scotia-instrumentation.com Website: www.Scotia-instrumentation.com</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
PRESSURE			Methods consistent with EURAMET CG3 and CG17.
<u>Gas Pressure (Gauge)</u>			
Calibration of pressure indicating instruments and gauges	-100 kPa to -3.5 kPa -3.5 kPa to 3.5 kPa 3.5 kPa to 100 kPa 100 kPa to 700 kPa 700 kPa to 900 kPa 900 kPa to 12 MPa	0.008 0 % 2.2 Pa 0.005 5 % 0.004 1 % 0.009 5 % 0.008 0 %	The calibration of Instruments with an electrical output may be undertaken.
Pressure equivalent calibration of dead weight testers including ball/nozzle type instruments	3.5 kPa to 100 kPa 100 kPa to 700 kPa 700 kPa to 900 kPa 900 kPa to 12 MPa	0.005 5 % 0.004 1 % 0.009 5 % 0.008 0 %	
<u>Gas Pressure (Absolute)</u>			
Calibration of pressure indicating instruments and gauges	10 kPa to 80 kPa 80 kPa to 115 kPa 115 kPa to 800 kPa 800 kPa to 1.1 MPa 1.1 MPa to 12.1 MPa	0.008 0 % + 37 Pa 0.020 % + 0.80 Pa 0.004 1 % + 30 Pa 0.009 5 % + 30 Pa 0.008 0 % + 30 Pa	
<u>Hydraulic Pressure (Gauge)</u>			
Calibration of pressure indicating instruments and gauges	600 kPa to 6 MPa 6 MPa to 140 MPa	0.008 6 % + 40 Pa 0.013% + 40 Pa	
Pressure equivalent calibration of Dead Weight Testers	600 kPa to 6 MPa 6 MPa to 140 MPa	0.009 0 % + 40 Pa 0.013% + 40 Pa	
<u>Gas Pressure (Differential)</u>			
Calibration of pressure indicating instruments and gauges	0.25 kPa to 420 kPa (line pressures 1.2 MPa to 2.1 MPa)	0.60 Pa/MPa of line pressure, + 0.007 5 % of differential pressure + 11 Pa	Differential pressure cells may be calibrated using the digital communication protocol.
	0.25 kPa to 420 kPa (line pressures 2.1 MPa to 20 MPa)	0.60 Pa/MPa of line pressure, + 0.006 0 % of differential pressure + 11 Pa	



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TEMPERATURE			Calibration performed within Liquid Baths
Liquid-in-glass thermometers	-30 °C to +250 °C	0.070 °C	Liquid-in-glass thermometers can be examined for compliance with the published specification marked on them if requested.
Resistance thermometers	-30 °C to +250 °C	0.045 °C	
Electronic thermometers with sensors	-30 °C to +250 °C	0.040 °C plus: Analogue- Half scale division Digital- One least significant digit	
Temperature indicators and recorders, with temperature sensor(s)	-10 °C to +40 °C -20 °C to +80 °C	1.1 °C 2.2 °C	Analogue type chart recorders
Block calibrators Portable liquid baths	-30 °C to +250 °C -30 °C to +250 °C	0.32 °C 0.040 °C	4mm diameter bores
ELECTRICAL MEASUREMENTS			
DC Resistance			These are source values available for the calibration of measuring equipment.
	1 Ω	95 μΩ/Ω	
	10 Ω	23 μΩ/Ω	
	100 Ω	10 μΩ/Ω	
	1 kΩ	8.5 μΩ/Ω	
	10 kΩ	8.5 μΩ/Ω	
	100 kΩ	11 μΩ/Ω	
	1 MΩ	20 μΩ/Ω	
	10 MΩ	40 μΩ/Ω	
	100 MΩ	100 μΩ/Ω	
	1 GΩ	630 kΩ	
	0 Ω to 20 Ω	50 μΩ/Ω + 40 μΩ	
	20 Ω to 200 Ω	17 μΩ/Ω + 100 μΩ	
	200 Ω to 2 kΩ	17 μΩ/Ω + 1.0 mΩ	
	2 kΩ to 20 kΩ	17 μΩ/Ω + 10 mΩ	
	20 kΩ to 200 kΩ	17 μΩ/Ω + 100 mΩ	
	200 kΩ to 2 MΩ	50 μΩ/Ω + 2.0 Ω	
	2 MΩ to 20 MΩ	85 μΩ/Ω + 100 Ω	
	20 MΩ to 200 MΩ	200 μΩ/Ω + 10 kΩ	
	200 MΩ to 2 GΩ	370 μΩ/Ω + 100 kΩ	
DC Voltage			Measurement of the output of sources using a digital multimeter and generation, for application to measuring devices, using a multi-function calibrator.
	0 mV to 200 mV	7.5 μV/V + 1.0 μV	
	200 mV to 2 V	5.0 μV/V + 1.5 μV	
	2 V to 20 V	3.5 μV/V + 4.0 μV	
	20 V to 200 V	5.0 μV/V + 40 μV	
	200 V to 1 kV	6.5 μV/V + 400 μV	
DC Current			
	0 μA to 200 μA	40 μA/A + 6.0 nA	
	200 μA to 2 mA	35 μA/A + 7.0 nA	
	2 mA to 20 mA	35 μA/A + 40 nA	
	20 mA to 200 mA	45 μA/A + 0.70 μA	
	200 mA to 2 A	80 μA/A + 12 μA	
	2 A to 10 A	350 μA/A + 480 μA	



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DC Current (continued) Generation only	10 A to 1000 A	0.060 % + 100 mA	For the calibration of current clamps and similar devices, using multi-turn coil technique.
AC Voltage	0.2 mV to 2 mV 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz 2 mV to 20 mV 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz 20 mV to 200 mV 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz 200 mV to 2 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz 2 V to 20 V 10 Hz to 400 Hz 400 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz 20 V to 200 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	1100 μ V/V + 4.0 μ V 1100 μ V/V + 4.0 μ V 1100 μ V/V + 4.0 μ V 1800 μ V/V + 10 μ V 1800 μ V/V + 10 μ V 2600 μ V/V + 20 μ V 8600 μ V/V + 20 μ V 350 μ V/V + 4.0 μ V 350 μ V/V + 4.0 μ V 350 μ V/V + 4.0 μ V 500 μ V/V + 5.0 μ V 1050 μ V/V + 10 μ V 1400 μ V/V + 20 μ V 2700 μ V/V + 20 μ V 90 μ V/V + 7.0 μ V 80 μ V/V + 7.0 μ V 80 μ V/V + 7.0 μ V 460 μ V/V + 17 μ V 900 μ V/V + 20 μ V 1400 μ V/V + 25 μ V 2700 μ V/V + 45 μ V 90 μ V/V + 15 μ V 45 μ V/V + 8.0 μ V 45 μ V/V + 8.0 μ V 110 μ V/V + 30 μ V 420 μ V/V + 80 μ V 1000 μ V/V + 200 μ V 1700 μ V/V + 300 μ V 90 μ V/V + 150 μ V 45 μ V/V + 50 μ V 45 μ V/V + 50 μ V 100 μ V/V + 200 μ V 275 μ V/V + 600 μ V 1000 μ V/V + 2 mV 1500 μ V/V + 32 mV 90 μ V/V + 2.5 mV 52 μ V/V + 1.0 mV 52 μ V/V + 1.0 mV 150 μ V/V + 2.0 mV	Measurement of the output of sources using a digital multimeter and generation, for application to measuring devices, using a multi-function calibrator.



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AC Voltage (continued)	200 V to 600 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	90 μ V/V + 40 mV 90 μ V/V + 40 mV 165 μ V/V + 60 mV 2300 μ V/V + 450 mV	
	600 V to 1 kV 40 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 30 kHz	90 μ V/V + 40 mV 165 μ V/V + 60 mV 600 μ V/V + 110 mV	
AC Current	10 μ A to 200 μ A 10 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	300 μ A/A + 8.0 nA 0.11% + 12 nA 0.13% + 65 nA	
	200 μ A to 2 mA 10 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	200 μ A/A + 35 nA 350 μ A/A + 0.11 μ A 0.11% + 0.65 μ A	
	2 mA to 20 mA 10 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	150 μ A/A + 0.35 μ A 300 μ A/A + 0.55 μ A 0.11% + 5 μ A	
	20 mA to 200 mA 10 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	150 μ A/A + 2.5 μ A 300 μ A/A + 3.5 μ A 900 μ A/A + 10 μ A	Measurement of the output of sources using a digital multimeter and generation, for application to measuring devices, using a multi-function calibrator.
	200 mA to 2 A 10 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	300 μ A/A + 35 μ A 850 μ A/A + 80 μ A 0.7 % + 160 μ A	
	2 A to 10 A 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	800 μ A/A + 0.17 mA 0.1 % + 0.38 mA 0.36 % + 0.75 mA	
	10 A to 820 A 50 Hz	0.080 % + 100 mA	For the calibration of current clamps and similar devices, using multi-turn coil technique.
Frequency	1.0 Hz to 2.4 GHz	2.4 in 10^9	Using GPS receiver and frequency counter.
Optical Tachometry	60 rpm to 60,000 rpm	2.6 rpm	Optical simulation.



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Oscilloscope Calibration			
Vertical deflection	2 mV to 10 mV 10 mV to 25 mV 25 mV to 130 mV 130 mV to 1.2 V 1.2 V to 3 V 3 V to 5 V 5 V to 50 V 50 V to 120 V	0.3 % + 4.2 μ V 0.15 % + 42 μ V 0.15 % + 0.42 mV 0.15 % + 4.5 mV 0.15 % + 20 mV 0.15 % + 20 mV 0.15 % + 20 mV 0.15 % + 20 mV	Using oscilloscope calibrator.
Horizontal deflection Time markers	10 ns to 100 μ s 100 μ s to 5 s	6.1 ns 10 μ s/s + 6.1 μ s	Using oscilloscope calibrator.
Temperature indicators and simulators, calibration by electrical simulation			
Base and Noble metal thermocouples	-250 $^{\circ}$ C to -200 $^{\circ}$ C -200 $^{\circ}$ C to 0 $^{\circ}$ C 0 $^{\circ}$ C to 1372 $^{\circ}$ C	1.8 $^{\circ}$ C 0.64 $^{\circ}$ C 0.34 $^{\circ}$ C	Including cold junction compensation
	-250 $^{\circ}$ C to -200 $^{\circ}$ C -200 $^{\circ}$ C to 0 $^{\circ}$ C 0 $^{\circ}$ C to 1372 $^{\circ}$ C	1.8 $^{\circ}$ C 0.60 $^{\circ}$ C 0.27 $^{\circ}$ C	Excluding 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: $Q[a, b] = [a^2 + b^2]^{1/2}$