Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

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Accredited to
ISO/IEC 17025:2017

Scotia Instrumentation Ltd

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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
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 10 kPa 10 kPa to 100 kPa 100 kPa to 700 kPa 700 kPa to 900 kPa 900 kPa to 12 MPa	0.012 % 0.008 0 % 0.006 5 % 0.007 0 % 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 10 kPa 10 kPa to 100 kPa 100 kPa to 700 kPa 700 kPa to 900 kPa 900 kPa to 12 MPa	0.008 0 % 0.006 5 % 0.007 0 % 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	0.040 % + 10 Pa 0.020 % + 0.80 Pa 0.007 0 % + 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) 0.25 kPa to 420 kPa (line pressures 2.1 MPa to 20 MPa)	0.60 Pa/MPa of line pressure, + 0.007 5 % of differential pressure + 11 Pa 0.60 Pa/MPa of line pressure, + 0.006 0 % of differential pressure + 11 Pa	Differential pressure cells may be calibrated using the digital communication protocol.

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
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			
	1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ	95 µΩ/Ω 23 µΩ/Ω 10 µΩ/Ω 8.5 µΩ/Ω 8.5 µΩ/Ω 11 µΩ/Ω 20 µΩ/Ω 40 µΩ/Ω 100 µΩ/Ω 630 kΩ	These are source values available for the calibration of measuring equipment.
	0 Ω to 20 Ω 20 Ω to 200 Ω 200 Ω to 2 kΩ 2 kΩ to 20 kΩ 20 kΩ to 200 kΩ 200 kΩ to 2 MΩ 2 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 2 GΩ	50 µΩ/Ω + 40 µΩ 17 µΩ/Ω + 100 µΩ 17 µΩ/Ω + 1.0 mΩ 17 µΩ/Ω + 10 mΩ 17 µΩ/Ω + 100 mΩ 50 µΩ/Ω + 2.0 Ω 85 µΩ/Ω + 100 Ω 200 µΩ/Ω + 10 kΩ 370 µΩ/Ω + 100 kΩ	Measurement of the output of sources using a digital multimeter and generation, for application to measuring devices, using a multi-function calibrator.
DC Voltage	0 mV to 200 mV 200 mV to 1 V 1 V to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1 kV	7.5 µV/V + 1.0 µV 5.0 µV/V + 1.5 µV 3.5 µV/V + 2.5 µV 3.5 µV/V + 4.0 µV 5.0 µV/V + 40 µV 6.5 µV/V + 400 µV	
DC Current	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	40 µA/A + 6.0 nA 35 µA/A + 7.0 nA 35 µA/A + 40 nA 45 µA/A + 0.70 µA 80 µA/A + 12 µA 350 µA/A + 480 µA	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
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*	 1100 µV/V + 4.0 µV 1100 µV/V + 4.0 µV 1100 µV/V + 4.0 µV 1800 µV/V + 10 µV 1800 µV/V + 10 µV 2600 µV/V + 20 µV 8600 µV/V + 20 µV	Measurement of the output of sources using a digital multimeter and generation, for application to measuring devices, using a multi-function calibrator.
	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*	 350 µV/V + 4.0 µV 350 µV/V + 4.0 µV 350 µV/V + 4.0 µV 500 µV/V + 5.0 µV 1050 µV/V + 10 µV 1400 µV/V + 20 µV 2700 µV/V + 20 µV	
	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*	 90 µV/V + 7.0 µV 80 µV/V + 7.0 µV 80 µV/V + 7.0 µV 460 µV/V + 17 µV 900 µV/V + 20 µV 1400 µV/V + 25 µV 2700 µV/V + 45 µV	
	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*	 90 µV/V + 15 µV 45 µV/V + 8.0 µV 45 µV/V + 8.0 µV 110 µV/V + 30 µV 420 µV/V + 80 µV 1000 µV/V + 200 µV 1700 µV/V + 300 µV	
	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*	 90 µV/V + 150 µV 45 µV/V + 50 µV 45 µV/V + 50 µV 100 µV/V + 200 µV 275 µV/V + 600 µV 1000 µV/V + 2 mV 1500 µV/V + 32 mV	
	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*	 90 µV/V + 2.5 mV 52 µV/V + 1.0 mV 52 µV/V + 1.0 mV 150 µV/V + 2.0 mV	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC Voltage (continued)			
	200 V to 600 V		
	10 Hz to 40 Hz	90 µV/V + 40 mV	
	40 Hz to 1 kHz	90 µV/V + 40 mV	
	1 kHz to 10 kHz	165 µV/V + 60 mV	
	10 kHz to 100 kHz	2300 µV/V + 450 mV	
	600 V to 1 kV		
	40 Hz to 1 kHz	90 µV/V + 40 mV	
	1 kHz to 10 kHz	165 µV/V + 60 mV	
	10 kHz to 30 kHz	600 µV/V + 110 mV	
AC Current	10 µA to 200 µA		
	10 Hz to 1 kHz	300 µA/A + 8.0 nA	
	1 kHz to 5 kHz	0.11% + 12 nA	
	5 kHz to 10 kHz	0.13% + 65 nA	
	200 µA to 2 mA		
	10 Hz to 1 kHz	200 µA/A + 35 µA	
	1 kHz to 5 kHz	350 µA/A + 0.11 µA	
	5 kHz to 10 kHz	0.11% + 0.65 µA	
	2 mA to 20 mA		
	10 Hz to 1 kHz	150 µA/A + 0.35 µA	
	1 kHz to 5 kHz	300 µA/A + 0.55 µA	
	5 kHz to 10 kHz	0.11% + 5 µA	
	20 mA to 200 mA		Measurement of the output of sources using a digital multimeter and generation, for application to measuring devices, using a multi-function calibrator.
	10 Hz to 1 kHz	150 µA/A + 2.5 µA	
	1 kHz to 5 kHz	300 µA/A + 3.5 µA	
	5 kHz to 10 kHz	900 µA/A + 10 µA	
	200 mA to 2 A		
	10 Hz to 1 kHz	300 µA/A + 35 µA	
	1 kHz to 5 kHz	850 µA/A + 80 µA	
	5 kHz to 10 kHz	0.7 % + 160 µA	
	2 A to 10 A		
	40 Hz to 1 kHz	800 µA/A + 0.17 mA	
	1 kHz to 5 kHz	0.1 % + 0.38 mA	
	5 kHz to 10 kHz	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.
Oscilloscope Calibration			
Vertical deflection	1 mV to 320 mV	0.18 % + 4.2 µV	Using oscilloscope calibrator.
	320 mV to 3.2 V	0.15 % + 42 µV	
	3.2 V to 32 V	0.15 % + 420 µV	
	32 V to 320 V	0.15 % + 4.5 mV	
	320 V to 1 kV	0.15 % + 20 mV	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
Horizontal deflection Time markers	10 ns to 100 µs 100 µs to 5 s	6.1 ns 10 µs/s + 6.1 µs	Using oscilloscope calibrator.
Temperature indicators and simulators, calibration by electrical simulation			
Base and Noble metal thermocouples	-250 °C to -200 °C -200 °C to 0 °C 0 °C to 1372 °C	1.8 °C 0.64 °C 0.34 °C	Including cold junction compensation
	-250 °C to -200 °C -200 °C to 0 °C 0 °C to 1372 °C	1.8 °C 0.60 °C 0.27 °C	Excluding 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: $Q[a, b] = [a^2 + b^2]^{1/2}$