Schedule of Accreditation

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TDC Calibration - a trading division of TDC Aberdeen 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
ELECTRICAL MEASUREMENTS			
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	Q[12 μV/V, 1.7 μV] Q[4.0 μV/V, 1.8 μV] Q[4.0 μV/V, 2.3 μV] Q[6.0 μV/V, 71 μV] Q[6.0 μV/V, 0.62 mV]	Using digital multimeter.
	1 kV to 10 kV 10 kV to 40 kV	1.5 % 2.0 %	Using high voltage divider.
DC CURRENT			
Measurement	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 10 A to 30 A	Q[12 μA/A, 0.90 nA] Q[11 μA/A, 9.3 nA] Q[17 μA/A, 94 nA] Q[66 μA/A, 2.4 μA] Q[0.15 mA/A, 0.24 mA] Q[0.027 %, 0.93 mA] Q[0.064 %, 5.1 mA]	
Generation	1 A to 3A 3 A to 11 A 11 A to 20.5 A	Q[450 μA/A, 50 μA] Q[600 μA/A, 600 μA] Q[0.12 %, 870 μA]	Using multifunction calibrator.
	20 A to 150 A 150 A 1000 A	Q[0.30 %, 0.020 A] Q[0.30 %, 0.060 A]	For calibration of current clamps and similar devices, using multi-turn coil arrangement.
DC RESISTANCE			
Measurement	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 1 GΩ	Q[12 μΩ/Ω, 33 μΩ] Q[16 μΩ/Ω, 0.12 mΩ] Q[11 μΩ/Ω, 1.2 mΩ] Q[11 μΩ/Ω, 13 mΩ] Q[11 μΩ/Ω, 0.24 Ω] Q[15 μΩ/Ω, 23 Ω] Q[27 μΩ/Ω, 2.4 kΩ] Q[0.15 mΩ/Ω, 23 kΩ] Q[0.16 %, 2.3 MΩ]	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ELECTRICAL MEASUREMENTS (cont'd)			
AC VOLTAGE			
Measurement	2 mV to 120 mV		Using digital multimeter
	20 Hz to 2 kHz	Q[0.010 %, 6.0 μV]	
	2kHz to 30 kHz	Q[0.027 %, 6 μV]	
	30 kHz to 100 kHz	Q[0.090%, 9 μV]	
	120 mV to 1.2 V		
	20 Hz to 2 kHz	Q[0.010 %, 22 μV]	
	2 kHz to 30 kHz	Q[0.027 %, 14 μV]	
	30 kHz to 100 kHz	Q[0.085 %, 70 μV]	
	100 kHz to 3001 MHz	Q[1.20 %, 1.4 mV]	
	1.2 V to 12 V		
	20 Hz to 2 kHz	Q[0.014 %, 72 μV]	
	2 kHz to 30 kHz	Q[0.027, 140 μV]	
	30 kHz to 100 kHz	Q[0.085, 0.7 mV]	
	100 kHz to 1 MHz	Q[1.20 %, 14 mV]	
	12 V to 120 V		
	20 Hz to 2 kHz	Q[0.011%, 710μV]	
	2 kHz to 30 kHz	Q[0.028 %, 1.4 mV]	
	30 kHz to 100 kHz	Q[0.085 %, 7 mV]	
	120 V to 1 kV		
	40 Hz to 2 kHz	Q[0.013 %, 31 mV]	
	2 kHz to 30 kHz	Q[0.28 %, 31 mV]	
	1 kV to 25 kV	4.0 %	Using high voltage divider.
	50 Hz		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ELECTRICAL MEASUREMENTS (cont'd)			
AC CURRENT			
Measurement	2 μA to 200 μA		Using digital multimeter.
	40 Hz to 2 kHz	Q[0.034 %, 12 nA]	
	2 kHz to 10 kHz	Q[0.24 %, 60 nA]	
	200 μA to 2 mA		
	40 Hz to 2 kHz	Q[0.033 %, 0.12 μA]	
	2 kHz to 10 kHz	Q[0.062 %, 0.12 μA]	
	2 mA to 20 mA		
	40 Hz to 2 kHz	Q[0.033 %, 1.2 μA]	
	2 kHz to 10 kHz	Q[0.06 %, 1.2 μA]	
	20 mA to 200 mA		
	40 Hz to 2 kHz	Q[0.033 %, 12 μA]	
	21 kHz to 10 kHz	Q[0.06 %, 12 μA]	
	200 mA to 1 A		
	40 Hz to 2 kHz	Q[0.036 %, 0.24 mA]	
	2 kHz to 10 kHz	Q[0.065 %, 0.24 mA]	
	1 A to 10 A		
	40 Hz to 2 kHz	Q[0.10 %, 1.2 mA]	
	2 kHz to 10 kHz	Q[0.10 %, 1.2 mA]	
	10 A to 30 A		
	40 Hz to 2 kHz	Q[0.10 %, 14 mA]	
	2 kHz to 10 kHz	Q[0.14 %, 14 mA]	
Generation	*45 Hz to 1 kHz*		Using multifunction calibrator.
	1 A to 3 A	Q[0.070 %, 120 μA]	
	45 Hz to 400 Hz		
	3 A to 11 A	Q[0.080 %, 2.3 mA]	
	11 A to 20.5 A	Q[0.14 %, 6.0 mA]	
	45 Hz to 400 Hz		
	20 A to 150 A	Q[0.33 %, 0.020 A]	For calibration of current clamps and similar devices, using multi-turn coil arrangement.
	150 A to 1000 A	Q[0.35 %, 0.10 A]	
CAPACITANCE	1 nF to 10 nF	Q[0.11 %, 5 pF]	Simulated capacitance suitable for the calibration of capacitance meters.
	10 nF to 100 nF	Q[0.067 %, 26 pF]	
	100 nF to 1 μF	Q[0.069 %, 0.24 nF]	
	1 μF to 10 μF	Q[0.053 %, 2.6 nF]	
	10 μF to 100 μF	Q[0.087 %, 26 nF]	
	100 μF to 1 mF	Q[0.0.087 %, 0.26 μF]	
	1 mF to 10 mF	Q[0.10 %, 2.6 μF]	
	10 mF to 100 mF	Q[0.10 %, 26 μF]	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
FREQUENCY	1 Hz to 3 GHz	7.5 in 10^{12}	Also suitable for calibration of timer counters averaged over a minimum of 1000 seconds gate time.
TIME INTERVAL			
Elapsed time	0 s to 1000 s 0 s to 1000 s	5.0 μs 0.30 s	Electronically triggered events Manually triggered events
OSCILLOSCOPE CALIBRATION			
Vertical deflection	0 V to ± 33 V	Q[0.30 %, 120 μV]	Using square wave signals.
Horizontal deflection	2 ns to 1 ms 1 ms to 100 ms 100 ms to 5 s	0.0030 % 0.015 % 0.60 %	Using pulse signals.
Bandwidth	*50 kHz to 300 MHz* 10 mV to 100 mV 100 mV to 5.5 V	 3.3 % 2.0 %	Using levelled sine wave generator. The results are reported in terms of the frequency at which the -3 dB point is obtained.
Additional measurements in support of 17th Edition type test equipment.			
RCD Current	*At 50 Hz:* 10 mA to 2.5 A	 Q[1.2 %, 1.6 mA]	
RCD Time	20 ms to 5 s	Q[1.2 %, 1.2 ms]	
Earth bond & Loop resistance	 20 mΩ 50 mΩ 100 mΩ 350 mΩ 500 mΩ 900 mΩ 1.7 Ω 4.7 Ω 9 Ω 17 Ω 47 Ω 90 Ω 170 Ω 470 Ω 900 Ω 1.7 kΩ	 14.6 mΩ 15.8 mΩ 15.7 mΩ 19.5 mΩ 20.4 mΩ 30.3 mΩ 1.2 Ω 1.2 Ω 1.2 Ω 1.2 Ω 1.4 Ω 1.4 Ω 1.8 Ω 3.6 Ω 6.8 Ω 13.4 Ω	
Earth bond current 1 mΩ to 960 mΩ 1.7 Ω to 1.7 kΩ	 10 mA to 4 A 4 A to 40 A 10 mA to 0.3 A 0.3 A to 3 A	 Q[1.2 %, 14 mA] Q[1.2 %, 140 mA] Q[0.3 %, 1.3 mA] Q[0.3 %, 100 mA]	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ELECTRICAL SIMULATION OF TEMPERATURE			
Resistance thermometer (Pt 100)	-200 °C to +800 °C	0.080 °C	By resistance simulation.
Temperature simulators, calibration by electrical simulation			
Type K thermocouple	-200 °C to +1372 °C	0.13 °C	Excluding cold junction compensation.
Type K thermocouple	-200 °C to +1372 °C	0.05 °C	Including cold junction compensation. Other thermocouple types may be calibrated, the temperature equivalent to μV will be calculated in accordance with the prevailing BS EN 60584-1 tables
Cold junction compensation	At ambient temperature of 20 °C ± 3 °C	0.15 °C	
Temperature indicators, calibration by electrical simulation		As per simulators plus resolution and stability of the device being calibrated.	
PRESSURE MEASUREMENTS			Methods consistent with EURAMET CG17.
Gas pressure (gauge)			
Calibration of pressure indicating instruments and gauges	- 80 kPa to -5 kPa -5 to -1.5 kPa -1.5 kPa to +1.5 kPa 1.5 kPa to 5 kPa 5 kPa to 100 kPa 100 kPa to 2.5 MPa	0.012 % 0.012 % 15 Pa 0.010 % 0.011 % 0.006 5 %	Pressure instruments with an electrical output may be calibrated.
Gas pressure (absolute)			
Calibration of pressure indicating instruments and gauges	20 kPa to 90 kPa 90 kPa to 200 kPa 200 kPa to 2.6 MPa	Q[0.012 %, 27 Pa] Q[0.011 %, 27 Pa] Q[0.006 5 %, 27 Pa]	
Hydraulic pressure (gauge)			
Calibration of pressure indicating instruments and gauges	600 kPa to 6.05 MPa 6.0 MPa to 120 MPa 120 MPa to 206.9 MPa	Q[0.012 %, 0.10 kPa] Q[0.013 %, 0.10 kPa] Q[0.012 %, 58 kPa]	
TEMPERATURE MEASUREMENTS			Calibration performed within Liquid Baths
Temperature indicators and recorders, with temperature sensors	-25 °C to 0 °C 0 °C to 100 °C 100 °C to 140 °C 140 °C to 400 °C 400 °C to 650 °C	0.18 °C 0.10 °C 0.070 °C 0.36 °C 0.28 °C	For immersion depth of 130 mm; shorter probes can be calibrated but with increased uncertainty.

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