Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines Upon Thames. TW18 3HR, UK

0789

Accredited to ISO/IEC 17025:2017

Campbell Associates Ltd

Issue No: 025 **Issue date**: 17 May 2024

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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
ACOUSTICS			
Pistonphones & sound calibrators			
Sound pressure level	250 Hz 1000 Hz	0.07 dB	Using Norsonic 1504 with NOR-1018 Software
Sound pressure level of multi-frequency calibrator	31.5 Hz to 63 Hz 63 Hz to 5 kHz 5 kHz to 8 kHz 8 kHz to 12.5 kHz 12.5 kHz to 16 kHz	0.13 dB 0.09 dB 0.12 dB 0.19dB 0.27 dB	
Amplitude stability	Dependent on instrument	0.02 dB	With WS2P microphone
Frequency	63 Hz to 16 kHz	0.10 % of reading	
Distortion	Dependent on instrument	14 % of reading	
Periodic testing of sound calibrators in accordance with BS EN IEC 60942:2003 and BS EN IEC 60942:2018	90 to 140 dB	Uncertainties as listed above See also remarks	Periodic testing of sound calibrators Class LS, 1 or 2 using Insert voltage technique using WS2P or LS2Pmicrophone as
Sound level meters			
Sound Level Meters	BS 7580:Part 1:1997	See remarks	Suitable to support the verification of Type 0, 1 & 2 SLMs originally manufactured in accordance with BS EN 60651:1994 BS EN 60804:1994 and for which appropriate correction factors are known and agreed

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ACOUSTICS (cont'd)			
Sound level meters			
Sound Level Meters	BS EN 61672-3:2006 (Withdrawn) as modified by UKAS TPS 49 Edition 2. June 2009.	See remarks	Suitable to support the verification of Class 1 & 2 SLMs originally manufactured in accordance with IEC 61672-3:2006 and for which required correction factors are known and agreed, including measurement of self generated noise with microphone fitted at customers request.
Sound Level Meters	BS EN 61672-3:2013	See remarks	Suitable to support the verification of Class 1 & 2 SLMs originally manufactured in accordance with IEC 61672-3:2013 and for which required correction factors are known and agreed, including measurement of self generated noise with microphone fitted at customers request.
Filters – sound level meter based			Filters originally manufactured
octave band filters	16 Hz to 16 kHz	0.13 dB	in accordance with IEC 61260:1995 (BS EN 61260:1996) or IEC 60225 in combination with a sound level meter
one-third octave band filters	16 Hz to 20 kHz	0.13 dB	
Reverberation time	50 Hz to 10 kHz		Suitable to support the verification of specific RT modules on sound level meters using transfer reference audio files i.e. computer generated multi-sine files to give the required decay curves
One- third octave bands	For R_t times of 0.1, 0.2, 0.5, 1 and 2 seconds	0.01 s	
	5 and 10 seconds	0.06 s	
Microphones			
Pressure sensitivity of 1", ½" & ¼" microphones @ reference frequency	250 Hz	0.1 dB	WSM type microphones
Electrostatic actuator response of 1" microphones	100 Hz to 4 kHz	0.21 dB	By electrostatic actuator methods
	>4 kHz to 8 kHz	0.24 dB	
	>8 kHz to 12.5 kHz	0.48 dB	

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACOUSTICS (cont'd)			
Microphones			
Electrostatic actuator response of ½" microphones	100 Hz to 4 kHz	0.21 dB	By electrostatic actuator methods
	>4 kHz to 8 kHz	0.24 dB	
	>8 kHz to 16 kHz	0.48 dB	The upper frequency limit for high sensitivity ½" microphones is 20 kHz
	>16 kHz to 20 kHz	0.7 dB	
	>20 kHz to 50 kHz	0.9 dB	
Electrostatic actuator response of ¼" microphones	100 Hz to 4 kHz	0.21 dB	By electrostatic actuator methods
	>4 kHz to 8 kHz	0.24 dB	
	>8 kHz to 16 kHz	0.48 dB	
	>16 kHz to 20 kHz	0.7 dB	
	>20 kHz to 50 kHz	0.9 dB	
	> 50 kHz to 100 kHz	1.2 dB	
Polarised self-capacitance of 1", ½" & ¼" microphones @ 250 Hz	1 pF to 100 pF	0.3%	
Low frequency response of ½" microphones (with pressure equalisation vent exposed to sound field)	2 Hz to 4 Hz	0.45 dB	Using microphone test chamber
	4 Hz to 25 Hz	0.27 dB	
	25 Hz to 100 Hz	0.26 dB	

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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACOUSTICS (cont'd)			
Tapping Machines			**Suitable to support verification of tapping machines in accordance with BS EN ISO 16283-2:2020; BS EN ISO 16283-2:2015 (Withdrawn) & BS EN ISO 140-7:1998 (Withdrawn)**
Velocity	0.70 m/s to 1.00 m/s	0.01 m/s	
Mass	480 g to 520 g	0.17 g	
Time	50 ms to 150 ms	0.25 ms	
Diameter	25 mm to 35 mm	0.03 mm	
Radius of curvature	300 mm to 700 mm	11 mm	
Angle of fall	0º to 0.6º	0.07°	
ACCELEROMETRY			
<u>Portable vibration field calibrators</u>			Portable vibration field calibrators to documented in-house procedure TP-15 "Calibration of Vibration Calibrators"
Acceleration:			
10 Hz to 20 Hz	1 ms^{-2} to 100 ms^{-2}	1.15 %	
20 Hz to 80 Hz	1 ms^{-2} to 100 ms^{-2}	0.78 %	
80 Hz	1 ms^{-2} to 100 ms^{-2}	0.64 %	Certificate of Conformance to BS EN ISO 8041:2017 Annex A for devices with matching specification by periodic verification
80 Hz to 1 kHz	1 ms^{-2} to 100 ms^{-2}	0.81 %	
1 kHz to 2 kHz	1 ms^{-2} to 100 ms^{-2}	1.55 %	
Frequency:			
8 Hz to 1280 Hz	1 ms^{-2} to 100 ms^{-2}	0.17 %	
Distortion (percentage of reading)	1 ms^{-2} to 100 ms^{-2}	0.18 %	

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