Schedule of Accreditation

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

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Accredited to ISO/IEC 17025:2017

UTAC UK Ltd

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Calibration Laboratory
Aston Way
Leyland
Preston
Lancashire
PR26 7TZ

Contact: Mr Vlad Enache
Tel: +44 (0)1525 842582
E-Mail: vlad.enache@utac.com
Website: www.utac.com

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			Electrical calibrations are performed as a comparison against a reference standard
DC RESISTANCE	0 Ω to 2 Ω 2 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 100 MΩ 100 MΩ to 1 GΩ	150 μΩ 30 μΩ/Ω 20 μΩ/Ω 12 μΩ/Ω 18 μΩ/Ω 116 μΩ/Ω 34 μΩ/Ω 26 μΩ/Ω 120 μΩ/Ω 358 μΩ/Ω	These values can be both measured and generated, the uncertainties listed are appropriate for the calibration of suitably stable sources and measuring devices of sufficient resolution.
DC VOLTAGE	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	20 μV 2 μV/V 4 μV/V 4 μV/V 20 μV	
DC CURRENT	0 μA to 20 μA 20 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	1 nA 4 μA/A 121 μA/A 14 μA/A 86 μA/A 190 μA/A 57 μA/A 220 μA/A	
AC VOLTAGE	2 mV to 100 mV *20 Hz to 40 Hz* *40 Hz to 2 kHz* *2 kHz to 10 kHz* *20 kHz to 100 kHz* *10 kHz to 30 kHz* *30 kHz to 60 kHz* *60 kHz t0 100 kHz* *100 kHz to 300 kHz* *300 kHz to 1 MHz*	 214 μV/V 230 μV/V 228 μV/V 67 μV 230 μV/V 276 μV/V 390 μV/V 760 μV/V 0.26 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC VOLTAGE continued	10 mV to 100 mV		These values can be both measured and generated, the uncertainties listed are appropriate for the calibration of suitably stable sources and measuring devices of sufficient resolution.
	20 Hz to 40 Hz	42 μV/V	
	40 Hz to 2 kHz	46 μV/V	
	2 kHz to 10 kHz	52 μV/V	
	10 kHz to 30 kHz	76 μV/V	
	30 kHz to 60 kHz	76 μV/V	
	60 kHz t0 100 kHz	140 μV/V	
	100 kHz to 300 kHz	0.08 %	
	300 kHz to 1 MHz	0.34 %	
	1 MHz to 2 MHz	0.36 %	
	2 MHz to 4 MHz	0.7 %	
	4 MHz to 6 MHz	0.9 %	
	6 MHz to 8 MHz	0.9 %	
	8 MHz to 10 MHz	1.8 %	
	100 mV to 1 V		
	20 Hz to 40 Hz	42 μV/V	
	40 Hz to 2 kHz	28 μV/V	
	2 kHz to 10 kHz	28 μV/V	
	10 kHz to 30 kHz	52 μV/V	
	30 kHz to 60 kHz	70 μV/V	
	60 kHz t0 100 kHz	120 μV/V	
	100 kHz to 300 kHz	0.030 %	
	300 kHz to 1 MHz	0.40 %	
	1 MHz to 2 MHz	0.60 %	
	2 MHz to 4 MHz	0.70 %	
	4 MHz to 6 MHz	0.80 %	
	6 MHz to 8 MHz	0.85 %	
	8 MHz to 10 MHz	0.90 %	
	1 V to 10 V		
	20 Hz to 40 Hz	28 μV/V	
	40 Hz to 2 kHz	28 μV/V	
	2 kHz to 10 kHz	28 μV/V	
	10 kHz to 30 kHz	52 μV/V	
	30 kHz to 60 kHz	70 μV/V	
	60 kHz t0 100 kHz	130 μV/V	
	100 kHz to 300 kHz	0.030 %	
	300 kHz to 1 MHz	0.40 %	
	1 MHz to 2 MHz	0.70 %	
	2 MHz to 4 MHz	0.80 %	
	4 MHz to 6 MHz	0.85 %	
	6 MHz to 8 MHz	0.90 %	
	8 MHz to 10 MHz	0.90 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC VOLTAGE continued	10 V to 100 V		
	20 Hz to 40 Hz	28 μV/V	These values can be both measured and generated, the uncertainties listed are appropriate for the calibration of suitably stable sources and measuring devices of sufficient resolution.
	40 Hz to 2 kHz	34 μV/V	
	2 kHz to 10 kHz	52 μV/V	
	10 kHz to 30 kHz	140 μV/V	
	30 kHz to 60 kHz	224 μV/V	
	60 kHz t0 100 kHz	270 μV/V	
	100 kHz to 300 kHz	0.26 %	
	100 V to 1 kV		
	40 Hz to 2 kHz	42 μV/V	
	2 kHz to 10 kHz	57 μV/V	
	10 kHz to 30 kHz	200 μV/V	
	30 kHz to 60 kHz	170 μV/V	
	60 kHz t0 100 kHz	220 μV	
AC CURRENT	2 μA to 10 μA		
	10 Hz to 10 kHz	0.36 %	
	10 μA to 100 μA		
	10 Hz to 5 kHz	350 μA/A	
	5 kHz to 10 kHz	380 μA/A	
	10 kHz to 20 kHz	350 μA/A	
	20 kHz to 30 kHz	600 μA/A	
	100 μA to 1 mA		
	10 Hz to 10 kHz	140 μA/A	
	10 kHz to 20 kHz	150 μA/A	
	20 kHz to 30 kHz	210 μA/A	
	1 mA to 10 mA		
	10 Hz to 30 kHz	150 μA/A	
	10 mA to 100 mA		
	10 Hz to 30 kHz	180 μA/A	
	100 mA to 1 A		
	10 Hz to 2 kHz	130 μA/A	
	1 kHz to 5 kHz	240 μA/A	
	5 kHz to 30 kHz	400 μA/A	
	1 A to 10 A		
	10 Hz to 10 kHz	320 μA/A	
	10 A to 30 A		
	10 Hz to 10 kHz	280 μA/A	
DC HIGH CURRENT	20 A to 1500 A	25 mA	These values can be or simulated using a multi turn coil generated, the uncertainties listed are appropriate for the calibration of suitably stable measuring devices of sufficient resolution.
AC HIGH CURRENT	*Up to 10 A* *10 Hz to 30 kHz*	12 mA	
	10 A – 1500 A *10 Hz to 10 kHz*	25 mA	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
FREQUENCY			
	0.1 Hz to 10 MHz	4.0 in 10^7	Generation and Measurement
TIME INTERVAL	0 s to 1 hr	4 ms	Measurement of elapsed time
ACCELERATION TRANSDUCERS – Sinusoidal			
Reference (precision) grades			
Piezoelectric Type			
Transducer at 23^{0}C:	Nominal peak acceleration 10 ms^{-2} to 60 ms^{-2}		Calibration of charge sensitivity by comparison with a single ended (precision grade) transducer
High frequency test	Transducer mass 0 grams to 80 grams Charge sensitivity 0.08 pC/ms^{-2} to 0.30 pC/ms^{-2}		
	20 Hz to 1.6 kHz 1.6 kHz – 4 kHz 5 kHz – 10 kHz	0.44 % 0.46 % 0.54 %	
	Transducer mass 80 grams to 600 grams Charge sensitivity 0.30 pC/ms^{-2} to 2.0 pC/ms^{-2}		
	20 Hz to 10 000 Hz	0.65 %	
Low frequency test	Charge sensitivity > 0.08 pC/ms^{-2}		
	2 Hz to 20 Hz	1.25 %	
Transducer and associated signal conditioner at 23 ^{0}C:			Calibration of transducer and signal conditioner systems can also be undertaken
High frequency test	Transducer mass 0 grams to 80 grams Voltage sensitivity 8 mV/ms^{-2} to 150 mV/ms^{-2}		
	20 Hz to 10 000 Hz	0.60 %	
	Transducer mass 80 grams to 600 grams Voltage sensitivity 8 mV/ms^{-2} to 150 mV/ms^{-2}		
	20 Hz to 10000 Hz	0.65 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACCELERATION TRANSDUCERS – Sinusoidal Continued			
Transducer and associated signal conditioner at 23 ^{0}C:			Calibration of transducer and signal conditioner systems can also be undertaken
Low frequency test	Sensitivity 3.0 mV/ms^{-2} to 150 mV/ms^{-2}		
	1 Hz to 20 Hz	1.82 %	
Integral electronics type			
Transducer at 23 ^{0}C:	Nominal peak acceleration 10 ms^{-2} to 60 ms^{-2}		
High frequency test	Transducer voltage sensitivity 0.12 mV/ms^{-2} to 150 mV/ms^{-2}		
	20 Hz to 5 kHz	0.50 %	
	6.3 kHz to 10 kHz	1.72 %	
Low Frequency test	Transducer voltage sensitivity 0.25 mV/ms^{-2} to 1000 mV/ms^{-2}		
	2 Hz to 20 Hz	1.72 %	
Piezoelectric Type			
Working (non-precision) grades			
Transducer at 23 ^{0}C	Nominal peak acceleration 1 ms^{-2} to 350 ms^{-2}		Calibration of charge sensitivity by comparison with a reference (precision grade) transducer. System calibrations comprising transducer (tx), signal conditioner and power supply can be undertaken within the quoted uncertainties.
High frequency test	Sensitivity (tx) or (system) 0.01 pC/ms^{-2} to 1000 pC/ms^{-2} (tx), 1.2 mV/ms^{-2} to 1000 mV/ms^{-2} (system)		
	20 Hz to 5000 Hz	1.25 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACCELERATION TRANSDUCERS – Sinusoidal continued			
Piezoelectric Type			
Working (non-precision) grades			
Transducer at 23 ^{0}C			
Low Frequency Test	Nominal peak acceleration 1 Hz: 1 ms^{-2} to 1.5 ms^{-2}		
	2 Hz to 4 Hz: 1 ms^{-2} to 5.0 ms^{-2}		
	5 Hz to 20 Hz: 1 ms^{-2} to 20 ms^{-2}		
	Sensitivity (tx)		
	0.300 pC/ms^{-2} to 1000 pC/ms^{-2} *1 Hz*	1.72 %	
	0.085 pC/ms^{-2} to 1000 pC/ms^{-2} *2 Hz to 4 Hz*	1.25 %	
	0.025 pC/ms^{-2} to 1000 pC/ms^{-2} *5 Hz to 20 Hz*	1.25 %	
	Sensitivity (system)		
	30 mV/ms^{-2} to 1000 mV/ms^{-2} *1 Hz*	1.5 %	
	8.5 mV/ms^{-2} to 1000 mV/ms^{-2} *2 Hz to 4 Hz*	1.25 %	
	2.5 mV/ms^{-2} to 1000 mV/ms^{-2} *5 Hz to 20 Hz*	1.25 %	
Transducer at any temperature from - 50 ^{0}C to + 200 ^{0}C:	Nominal peak acceleration 1 ms^{-2} to 40 ms^{-2}		
	Sensitivity (tx) or (system) 0.01 pC/ms^{-2} to 1000 pC/ms^{-2} (tx), 1.2 mV/ms^{-2} to 1000 mV/ms^{-2} (system)		
	20 Hz to 630 Hz	1.5 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACCELERATION TRANSDUCERS – Sinusoidal continued			
Piezoresistive or strain-gauge type			
Working (non-precision) grades			
Transducer at 23 ^{0}C:			
High frequency test	Nominal peak acceleration 1 ms^{-2} to 350 ms^{-2}		Calibration of voltage sensitivity by comparison with a reference (precision grade) transducer. System calibrations comprising transducer (tx), signal conditioner and power supply can be undertaken within the quoted uncertainties.
	Sensitivity (tx) or (system) 0.02 mV/ms^{-2} to 1000 mV/ms^{-2} (tx), 1.2 mV/ms^{-2} to 1000 mV/ms^{-2} (system)		
	20 Hz to 5000 Hz	1.72 %	
Low frequency test	Nominal peak acceleration 1 Hz: 1 ms^{-2} to 1.5 ms^{-2}		
	Sensitivity (tx)		
	0.60 mV/ms^{-2} to 1000 mV/ms^{-2} *1 Hz*	1.72 %	
	0.17 mV/ms^{-2} to 1000 mV/ms^{-2} *2 Hz to 4 Hz*	1.72 %	
	0.05 mV/ms^{-2} to 1000 mV/ms^{-2} *5 Hz to 20 Hz*	1.72 %	
	Sensitivity (system)		
	30 mV/ms^{-2} to 1000 mV/ms^{-2} *1 Hz*	1.72 %	
	8.5 mV/ms^{-2} to 1000 mV/ms^{-2} *2 Hz to 4 Hz*	1.72 %	
	2.5 mV/ms^{-2} to 1000 mV/ms^{-2} *5 Hz to 20 Hz*	1.72 %	
Transducer at any temperature from - 50 ^{0}C to + 200 ^{0}C:	Nominal peak acceleration 1 ms^{-2} to 40 ms^{-2}		
	Sensitivity (tx) or (system) 0.02 mV/ms^{-2} to 1000 mV/ms^{-2} (tx) 1.2 mV/ms^{-2} to 1000 mV/ms^{-2} (system)		
	20 Hz to 630 Hz	2.0 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACCELERATION TRANSDUCERS – Sinusoidal continued			
Working (non-precision) grades (cont'd)			
Integral electronics type Transducer at 23 ^{0}C:	Nominal peak acceleration 1 ms^{-2} to 350 ms^{-2}		
High frequency test	Sensitivity (tx) or (system) 0.12 mV/ms^{-2} to 1000 mV/ms^{-2} (tx), 1.2 mV/ms^{-2} to 1000 mV/ms^{-2} (system)		Calibration of voltage sensitivity by comparison with a reference (precision grade) transducer. System calibrations comprising transducer (tx), signal conditioner and power supply can be undertaken within the stated CMCs.
	20 Hz to 5000 Hz	1.8 %	
Low frequency test	Nominal peak acceleration 1 Hz: 1 ms^{-2} to 1.5 ms^{-2}		
	2 Hz to 4 Hz: 1 ms^{-2} to 5.0 ms^{-2}		
	5 Hz to 20 Hz: 1 ms^{-2} to 20 ms^{-2}		
	Sensitivity (tx)		
	3.0 mV/ms^{-2} to 1000 mV/ms^{-2} *1 Hz*	1.72 %	
	0.85 mV/ms^{-2} to 1000 mV/ms^{-2} *2 Hz to 4 Hz*	1.72 %	
	0.25 mV/ms^{-2} to 1000 mV/ms^{-2} *5 Hz to 20 Hz*	1.72 %	
	Sensitivity (system)		
	30 mV/ms-2 to 1000 mV/ms-2 *1 Hz*	1.72 %	
	8.5 mV/ms^{-2} to 1000 mV/ms^{-2} *2 Hz to 4 Hz*	1.72 %	
	2.5 mV/ms^{-2} to 1000 mV/ms^{-2} *5 Hz to 20 Hz*	1.72 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACCELERATION TRANSDUCERS – Sinusoidal continued Working (non-precision) grades (cont'd) <u>Integral electronics type</u> (cont'd) Transducer at any temperature from - 50 ^{0}C to + 200 ^{0}C:	Nominal peak acceleration 1 ms^{-2} to 40 ms^{-2} Sensitivity 0.12 mV/ms^{-2} to 1000 mV/ms^{-2} (tx), 1.2 mV/ms^{-2} to 1000 mV/ms^{-2} (system) *20 Hz to 630 Hz*	 2.0 %	
ACCELERATION TRANSDUCERS - SHOCK CALIBRATION Working (non-precision) grades <u>Piezoelectric type</u> Transducer at 23 ^{0}C:	Sensitivity 0.0001 pC/ms^{-2} to 100 pC/ms^{-2} 200 ms^{-2} to 5000 ms^{-2} 5000 ms^{-2} to 50000 ms^{-2}	 1.72 % 2.58 %	The transducer to be calibrated must have a mass of no more than 40 grams Calibration of charge sensitivity by comparison with a reference (precision grade) transducer
<u>Piezoresistive type</u> Transducer at 23 ^{0}C:	Sensitivity 0.0001 mV/ms^{-2} to 100 mV/ms^{-2} 200 ms^{-2} to 5000 ms^{-2} 5000 ms^{-2} to 50000 ms^{-2}	 1.72 % 2.58 %	The upper limit for the calibrated acceleration level is subject to a maximum charge output of 10 nC, e.g. for a device sensitivity of 1 pC/ms^{-2} the maximum acceleration level for calibration would be: 10 nC / 1 pC/ms^{-2} = 10000 ms^{-2} Calibration of voltage sensitivity by comparison with a reference (precision grade) transducer The upper limit for the calibrated acceleration level is subject to a maximum voltage output of 10 V, e.g. for a device sensitivity of 1 mV/ms^{-2} the maximum acceleration level for calibration would be: 10 V / 1 mV/ms^{-2} = 10000 ms

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ACCELERATION TRANSDUCERS - SHOCK CALIBRATION			
Working (non-precision) grades			
<u>Integral electronics type</u>			
Transducer at 23 ^{0}C:	Sensitivity 0.0001 mV/ms^{-2} to 100 mV/ms^{-2}		Calibration of voltage sensitivity by comparison with a reference (precision grade) transducer.
	200 ms^{-2} to 5000 ms^{-2} 5000 ms^{-2} to 50000 ms^{-2}	1.72 % 2.58 %	The upper limit for the calibrated acceleration level is subject to a maximum voltage output of 10 V, e.g. for a device sensitivity of 1 mV/ms^{-2} the maximum acceleration level for calibration would be: 10 V / 1 mV/ms^{-2} = 10000 ms^{-2}
<u>System</u>			
System components at 23 ^{0}C:	Sensitivity 0.0001 mV/ms^{-2} to 100 mV/ms^{-2}		Calibration of system voltage sensitivity by comparison with a reference (precision grade) transducer.
	200 ms^{-2} to 5000 ms^{-2} 5000 ms^{-2} to 50000 ms^{-2}	1.72 % 2.58 %	System calibrations comprising transducer, signal conditioner and power supply can be undertaken. The upper limit for the calibrated acceleration level is dependent on the system conditioner configuration and output
CHARGE AMPLIFIERS			
Precision and working grade types for use with transducers	Calibration of voltage output per picocoulomb or millivolt input *1 Hz to 100 kHz*	0.40 %	Minimum input 1 pC or 10 mV
With respect to a set point of 160 Hz with reference at voltages between 10 mV and 1 V			
PORTABLE CALIBRATORS	*20 Hz to 2 kHz*	1.72 %	Calibration of portable calibrators by comparison methods
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: $Q[a, b] = [a^2 + b^2]^{1/2}$