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

TMS Europe Ltd

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Unit 10 **Stretfield Mill** **Bradwell** **Hope Valley** **S33 9JT**	**Contact: Mr S Nuttall** **Tel: +44 (0)1433 620535** **Fax: +44 (0)1433 621492** **E-Mail: sales@tmseurope.co.uk** **Website: www.tmseurope.co.uk**

Calibration performed by the Organisations at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Unit 10 Stretfield Mill Bradwell Hope Valley S33 9JT	**Local contact** Mr B Hanwell Tel: +44 (0)1433 620535 Fax: +44 (0)1433 621492 Email: sales@tmseurope.co.uk Website: www.tmseurope.co.uk	Electrical Time Humidity Pressure Temperature	P

Site activities performed away from the locations listed above:

Location details		Activity	Location code
The customers' site or premises must be suitable for the nature of the particular calibrations undertaken and will be the subject of contract review arrangements between the laboratory and the customer	Contact as above	Electrical Time Pressure Temperature Humidity	S

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION				
DC VOLTAGE				
Measurement and Generation	0 mV to 25 mV 25 mV to 50 mV 50 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 1 kV	0.0025 % + 1.0 μV 0.0020 % + 1.0 μV 0.0015 % + 1.0 μV 0.0020 % + 50 μV 0.0015 % + 1.4 mV 0.0025 % + 7.0 mV	Known values of DC Voltage for application to measuring instruments or measurement of DC voltages supplied by generators, power supplies etc.	P
DC CURRENT				
Measurement	0 μA to 10 μA 10 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA	0.0045 % + 3.8 nA 0.0045 % + 11 nA 0.0045 % + 100 nA 0.0040 % + 1.0 μA 0.0039 % + 10 μA	Voltage and resistance method	P
	0 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.058 % + 3.0 μA 0.058 % + 14 μA 0.12 % + 190 μA 0.14 % + 0.74 mA	Using digital multimeter	
Generation	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 20 A	0.012 % + 23 nA 0.0092 % + 98 nA 0.0092 % + 1.0 μA 0.010 % + 13 μA 0.048 % + 140 μA 0.035 % + 2.0 mA 0.035 % + 8.0 mA	Using multi-function calibrator.	P
DC RESISTANCE				
Measurement and Generation	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ	0.0065 % + 46 μΩ 0.0022 % + 2.4 mΩ 0.0022 % + 4.6 mΩ 0.0017 % + 12 mΩ 0.0020 % + 120 mΩ 0.0047 % + 2.3 Ω 0.0057 % + 100 Ω	Known values of DC Resistance for application to measuring instruments or measurement of DC resistances supplied by resistors, resistance boxes and similar instruments.	P
Generation	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ	30 mΩ 33 mΩ 81 mΩ 610 mΩ 6.4 Ω 130 Ω 6.0 kΩ 130 kΩ	Known, fixed values of DC resistance for application to resistance measuring devices.	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC VOLTAGE				
Measurement	*50 Hz to 200 Hz*		Using digital multimeter.	P
	100 μV to 100 mV	0.072 % + 120 μV		
	10 Hz to 20 kHz			
	100 mV to 1 V	0.071 % + 420 μV		
	1 V to 10 V	0.071 % + 6.0 mV		
	10 V to 100 V	0.071 % + 120 mV		
	100 V to 750 V	0.071 % + 570 mV		
Generation	1 mV to 200 mV		Using multi-function calibrator.	P
	40 Hz to 45 Hz	0.065 % + 60 μV		
	45 Hz to 1 kHz	0.033 % + 65 μV		
	1 kHz to 20 kHz	0.090 % + 250 μV		
	200 mV to 2 V			
	10 Hz to 45 Hz	0.060 % + 500 μV		
	45 Hz to 1 kHz	0.031 % + 900 μV		
	1 kHz to 2 kHz	0.035 % + 350 μV		
	2 kHz to 20 kHz	0.056 % + 650 μV		
	20 kHz to 50 kHz	0.20 % + 3.3 mV		
	2 V to 20 V			
	40 Hz to 45 Hz	0.060 % + 4.1 mV		
	45 Hz to 1 kHz	0.031 % + 4.3 mV		
	1 kHz to 2 kHz	0.035 % + 4.7 mV		
	2 kHz to 20 kHz	0.056 % + 6.2 mV		
	20 V to 200 V			
	40 Hz to 45 Hz	0.041 % + 35 mV		
	45 Hz to 1 kHz	0.040 % + 38 mV		
	1 kHz to 2 kHz	0.043 % + 29 mV		
	2 kHz to 20 kHz	0.083 % + 90 mV		
	200 V to 1000 V			
	40 Hz to 45 Hz	0.053 % + 170 mV		
	45 Hz to 1 kHz	0.037 % + 170 mV		
	1 kHz to 10 kHz	0.084 % + 500 mV		
AC CURRENT				
Generation	*40 Hz to 1 kHz*		Using multi-function calibrator.	P
	25 μA to 2 mA	0.060 % + 52 μA		
	2 mA to 20 mA	0.056 % + 56 μA		
	20 mA to 200 mA	0.061 % + 65 μA		
	200 mA to 2 A	0.072 % + 450 μA		
	1 A to 10 A			
	45 Hz to 200 Hz	0.14 % + 7.0 mA		
	200 Hz to 1 kHz	0.20 % + 9.3 mA		
	10 A to 20 A			
	40 Hz to 100 Hz	0.14 % + 14 mA		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC RESISTANCE				
Measurement	*At 25 Hz and 75 Hz* 0 Ω to 400 Ω	0.0024 % + 100 μΩ	Measurement of resistors using AC bridge.	P
Calibration of 16th/17th Edition electrical testers				
Loop Resistance (Generation)	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 kΩ	0.58 % + 30 mΩ 0.58 % + 36 mΩ 0.58 % + 130 mΩ	Known 50 Hz resistance values for application to loop testers.	
Capacitance	*At 1 kHz:* 10 nF, 20 nF, 50 nF, 100 nF and 1 μF	0.66 % + 420 pF	Known, fixed values of capacitance for application to capacitance measuring instruments.	P
FREQUENCY				
Generation	10 Hz to 100 Hz 100 Hz to 10 MHz	0.017 % 0.0024 %	Using synthesised source	P
Measurement	3 Hz to 5 Hz 5 Hz to 10 Hz 10 Hz to 40 Hz 40 Hz to 300 Hz 300 Hz to 3 kHz 3 kHz to 30 kHz 30 kHz to 300 kHz	9.5 mHz 6.8 mHz 15 mHz 38 mHz 360 mHz 3.6 Hz 35 Hz	Measured at 1.0 V	P
Temperature indicators, calibration by electrical simulation				
Base metal thermocouples	-200 °C to 0 °C 0 °C to 1370 °C	0.50 °C 0.30°C	Including cold junction compensation	P and S
Noble metal thermocouples	0 °C to 600 °C 600 °C to 1600 °C	0.50 °C 0.40 °C	Including cold junction compensation	P and S
Resistance thermometers (Pt100)	-200 °C to +800 °C	0.036 °C to 0.094 °C	For 4-wire measurements. The quoted uncertainties may be increased for 2-wire configurations.	P and S
TIME INTERVAL				
Mechanical and Electronic Timers	10 s to 24 hrs	0.015 s/h + 0.065 s	Comparison with standard timer.	P and S
Optical Tachometers	18 rpm to 30 rpm 30 rpm to 60 rpm 60 rpm to 240 rpm 240 rpm to 600 rpm 600 rpm to 2400 rpm 2400 rpm to 18,000 rpm 18,000 rpm to 30,000 rpm 30,000 rpm to 90,000 rpm	0.15 % 0.065 % 0.036 % 0.045 % 0.036 % 0.016 % 4.0 rpm 11 rpm	Application of optical pulses of known repetition rate.	P

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
HUMIDITY			By comparison with dew-point hygrometer and Platinum Resistance Thermometers Instruments with an electrical output can be calibrated	
Dew point	-20 °C to +30 °C 30 °C to +46 °C	0.20 °C 0.20 °C		P
Temperature probes in air	10 °C to 50 °C	0.049 °C		
Relative humidity	Example conditions	Corresponding to above dew-point and temperature uncertainties	Humidity limits: 11 %rh to 95 %rh at 10 °C 5 %rh to 95 %rh at 20 °C 5 %rh to 95 %rh at 35 °C 5 %rh to 85 %rh at 50 °C	
At 10 °C	11 %rh 50 %rh 95 %rh	0.40 %rh 0.84 %rh 1.5 %rh		
At 20 °C	5 %rh 50 %rh 95 %rh	0.40 %rh 0.80 %rh 1.4 %rh		
At 50 °C	5 %rh 50 %rh 85 %rh	0.40 %rh 1.0 %rh 1.5 %rh		
Temperature probes in air	10 °C to 50 °C	0.40 °C to 0.90 °C		S
Temperature measurement in air	10 °C to 50 °C	0.40 °C to 0.90 °C*	*An additional uncertainty component will normally be applicable owing to the thermal variations within the test environment	
Relative humidity probes and environmental controlled chambers inclusive of associated indicators controllers and recorders			By comparison with reference hygrometer and Platinum Resistance Thermometers	
At 10 °C	10 %rh 50 %rh 90 %rh	1.1 %rh 2.3 %rh 3.7 %rh		
At 20 °C	10 %rh 50 %rh 90 %rh	1.1 %rh 1.5 %rh 2.2 %rh		
At 50 °C	10 %rh 50 %rh 90 %rh	1.2 %rh 2.2 %rh 3.0 %rh		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2))	Remarks	Location Code
PRESSURE			Methods consistent with EURAMET CG17.	
Gauge gas pressure	-625 Pa to +525 Pa	0.32% + 2.3 Pa	Instruments with an electrical output can be calibrated	P and S
	-95 kPa to +2.0 MPa	0.0063 % + 39 Pa		P
	-95 kPa to +2.0 MPa	0.0070 % + 0.35 kPa		S
Gauge gas absolute	5 kPa to 2.1 MPa	0.0070 % + 30 Pa	Achievable range may be reduced in the absence of a physical pressure port on the device	P
	95 kPa to 115 kPa	6.0 Pa		P
	70 kPa to 115 kPa	0.018 % + 45 Pa		S
	20 kPa to 2.1 MPa	0.022 % + 0.40 kPa	.	S
Gauge hydraulic pressure	2 MPa to 70 MPa	0.010 % + 3.5 kPa		P and S
TEMPERATURE			Unless utherwise stated calibration performed by comparison with reference thermometers	
Resistance Thermometers	-196 °C -100 °C to -80 °C -80 °C to -40 °C -40 °C to 0 °C Ice point 0 °C 0.01 °C 0 °C to 300 °C 300 °C to 650 °C	0.050 °C 0.18 °C 0.043 °C 0.024 °C 0.015 °C 0.0050 °C 0.022 °C 0.35 °C	Liquid Nitrogen. Calibration performed within Liquid Baths Triple point of water Calibration performed within Metal Block Baths	P
Platinum thermocouples	0 °C to 300 °C 300 °C to 600 °C 600 °C to 1100 °C 1100 °C to 1600 °C	0.60 °C 0.85 °C 0.81 ºC 2.1 °C	Calibration performed within Metal Block Baths or within Tube Furnaces	P
Other thermocouples	-196 °C -100 °C to -80 °C -80 °C to 0 °C 0 °C to 40 °C 40 °C to 300 °C 300 °C to 1100 °C 1100 °C to 1600 °C	0.25 °C 0.30 °C 0.20 °C 0.11 °C 0.20 °C 0.84 °C 2.1 °C	Liquid Nitrogen. Calibration performed within Metal Block Baths or within Tube Furnaces	P
Other thermocouples	-196 °C -100 °C to -80 °C -80 °C to 0 °C 0 °C to 300 °C 300 °C to 1100 °C 1100 °C to 1600 °C	0.25 °C 0.30 °C 0.20 °C 0.20 °C 1.0 °C 2.5 °C	Liquid Nitrogen. Calibration performed within Liquid Baths or within Tube Furnaces	S

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
TEMPERATURE (continued)				
Thermometers connected to suitable indicators	-196 °C -100 °C to -80 °C -80 °C to 0 °C 0 °C to 300 °C 300 °C to 400 °C	0.20 °C 0.30 °C 0.20 °C 0.10 °C 1.0 °C	Including instruments incorporated in customers Freezers, fridges, ovens chambers incubators and furnaces	S
Temperature Controlled Autoclaves, Chambers, Environmental Cabinets, Furnaces, Liquid Baths, Fridges/Refrigerators, Freezers, Incubators and Ovens	-80 °C to 0 °C 0 °C to 300 °C 300 °C to 1100 °C 1100 °C to 1600 °C	0.20 °C (PRTs) 0.50 °C (thermocouples) 0.10 °C (PRTs) 0.50 °C (thermocouples) 1.0 °C 2.5 °C	Single and multipoint time dependent temperature profiling, also referred to as spatial temperature surveying or mapping	P and S
Compensating and extension cables	-196 °C -100 °C to -80 °C -80 °C to +250 °C	0.25 °C 0.35 °C 0.25 °C	Liquid Nitrogen. Calibration performed within Metal Block Baths or within Tube Furnaces	P and S
Mechanical Dial type and Electronic thermometers with sensors	Range as per sensor	As for sensor	Instruments with an electrical output can be calibrated	P and S
Metal block calibrators	-50 °C to +300 °C 300 °C to 1100 °C	0.16 °C 1.2 °C	Method consistant with Euramet cg13	P
Metal block calibrators	-50 °C to +300 °C 300 °C to 650 °C 650 °C to 1100 °C	0.20 °C 2.5 °C 4.0 °C	Method consistant with Euramet cg13	S
Radiation thermometers (pyrometers)	-50 °C to +20 °C 20 °C to 100 °C 100 °C to 200 °C 200 °C to 350 °C 350 °C to 480 °C 480 °C to 600 °C 600 °C to 900 °C 900 °C to 1200 °C 1300 °C to 1500 °C	1.0 °C 0.5 °C 0.7 °C 1.2 °C 1.7 °C 2.5 °C 2.5 °C 2.7 °C 5.0 °C	Calibration performed by comparison with reference radiation thermometer For an emissivity of 1.0. Other emissivities can be specified but will attract an additional uncertainty.	P

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 uncertainty of measurement 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 CIPM-ILAC definition of the CMC is as follows:

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 CMC is stated only as a percentage, this is to be interpreted as meaning percentage of the measurand.

Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \cdot 0.01 \cdot q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$