Schedule of Accreditation

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Accredited to ISO/IEC 17025:2017

TMS Europe Ltd

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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 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	Q[0.0012 %, 1.4 μV] Q[0.0014 %, 6.1 μV] Q[0.0009 %, 40 μV] Q[0.0010 %, 0.57 μV] Q[0.0013 %, 7.5 mV]	Known values of DC Voltage for application to measuring instruments or measurement of DC voltages supplied by generators, power supplies etc.	P
Generation	0 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	Q[35 μV/V, 4.3 μV] Q[35 μV/V, 9.2 μV] Q[29 μV/V, 81 μV] Q[35 μV/V, 0.85 mV] Q[35 μV/V, 5.9 mV]		
DC CURRENT				
Measurement	0 μA to 100 μA 100 μA to 1 μA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	Q[0.0058 %, 0.011 μA] Q[0.0058 %, 0.044 μA] Q[0.0058 %, 0.41 μA] Q[0.012 %, 1.0 mA] Q[0.018 %, 10 mA] Q[0.14 %, 0.90 mA]	Using digital multimeter	P
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 30 A	Q[0.012 %, 35 nA] Q[0.0093 %, 35 nA] Q[0.0058 %, 43 nA] Q[0.0093 %, 4.6 μA] Q[0.018 %, 110 μA] Q[0.047 %, 2.0 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 10 MΩ to 100 MΩ	Q[24 μΩ/Ω, 0.24 mΩ] Q[16 μΩ/Ω, 1.1 mΩ] Q[16 μΩ/Ω, 6.9 mΩ] Q[16 μΩ/Ω, 68 mΩ] Q[16 μΩ/Ω, 0.9 Ω] Q[21 μΩ/Ω, 15 Ω] Q[37 μΩ/Ω, 0.43 kΩ] Q[0.047 %, 16 kΩ]	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	0.1 Ω 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ	Q[0.018 %, 5.8 mΩ] Q[0.012 %, 5.8 mΩ] Q[0.012 %, 5.8 mΩ] Q[0.0058 %, 5.8 mΩ] Q[0.0047 %, 47 mΩ] Q[0.0047 %, 0.47 Ω] Q[0.0047 %, 4.7 Ω] Q[0.012 %, 49 Ω] Q[0.041 %, 0.49 kΩ] Q[0.58 %, 6.6 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	*10 Hz to 20 kHz*		Using digital multimeter.	P
	100 µV to 100 mV	Q[0.070 %, 60 µV]		
	100 mV to 1 V	Q[0.070 %, 0.5 mV]		
	1 V to 10 V	Q[0.070 %, 5.4 mV]		
	10 V to 100 V	Q[0.070 %, 50 mV]		
	100 V to 750 V	Q[0.070 %, 0.36 V]		
	20 kHz to 50 kHz			
	100 µV to 100 mV	Q[0.014 %, 72 µV]		
	100 mV to 1 V	Q[0.014 %, 0.68 mV]		
	1 V to 10 V	Q[0.014 %, 7.1 mV]		
	10 V to 100 V	Q[0.014 %, 69 mV]		
	100 V to 750 V	Q[0.014 %, 0.45 V]		
	50 kHz to 100 kHz			
	100 µV to 100 mV	Q[0.70 %, 0.94 mV]		
	100 mV to 1 V	Q[0.70 %, 1.3 mµV]		
	1 V to 10 V	Q[0.70 %, 15 mV]		
	10 V to 100 V	Q[0.70 %, 0.63 V]		
	100 V to 750 V	Q[0.70 %, 0.98 V]		
	100 kHz to 300 kHz			
	100 µV to 100 mV	Q[4.7 % + 0.64 mV]		
	100 mV to 1 V	Q[4.7 % + 6.6 mV]		
Generation	0 mV to 200 mV		Using multi-function calibrator.	P
	10 Hz to 44 Hz	Q[0.24 %, 90 µV]		
	44 Hz to 1 kHz	Q[0.050 %, 50 µV]		
	1 kHz to 20 kHz	Q[0.11 %, 220 µV]		
	20 kHz to 100 kHz	Q[0.35 %, 2.6 mV]		
	100 kHz to 500 kHz	Q[0.95 %, 2.6 mV]		
	200 mV to 2 V			
	10 Hz to 44 Hz	Q[0.24 %, 750 µV]		
	44 Hz to 1 kHz	Q[0.050 %, 420 µV]		
	1 kHz to 20 kHz	Q[0.11 %, 580 µV]		
	20 kHz to 100 kHz	Q[0.30 %, 3.2 mV]		
	100 kHz to 500 kHz	Q[0.52 %, 26 mV]		
	2 V to 20 V			
	10 Hz to 44 Hz	Q[0.24 %, 8.3 mV]		
	44 Hz to 1 kHz	Q[0.042 %, 7.0 mV]		
	1 kHz to 20 kHz	Q[0.084 %, 7.1 mV]		
	20 kHz to 100 kHz	Q[0.26 %, 43 mV]		
	20 V to 200 V			
	30 Hz to 44 Hz	Q[0.070 %, 120 mV]		
	44 Hz to 1 kHz	Q[0.046 %, 120 mV]		
	1 kHz to 10 kHz	Q[0.11 %, 180 mV]		
	200 V to 1000 V			
	40 Hz to 44 Hz	Q[0.070 %, 470 mV]		
	44 Hz to 1 kHz	Q[0.046 %, 370 mV]		
	1 kHz to 10 kHz	Q[0.18 %, 860 mV]		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC CURRENT				
Measurement	*40 Hz to 1kHz*			
	0 A to 1 A	Q[0.12 %, 2 mA]	Using digital multimeter.	
	1 A to 3A	Q[0.18%, 2.8 mA]		
Generation	20 µA to 200 µA		Using multi-function calibrator.	P
	10 Hz to 44 Hz	Q[0.24 %, 0.30 µA]		
	44 Hz to 1 kHz	Q[0.082 %, 0.32 µA]		
	1 kHz to 10 kHz	Q[0.93 %, 0.70 µA]		
	0.2 mA to 2 mA			
	10 Hz to 44 Hz	Q[0.24 %, 1.1 µA]		
	44 Hz to 1 kHz	Q[0.082 %, 1.1 µA]		
	1 kHz to 10 kHz	Q[0.93 %, 5.9 µA]		
	2 mA to 20 mA			
	10 Hz to 44 Hz	Q[0.24 %, 8.4 µA]		
	44 Hz to 1 kHz	Q[0.070 %, 7.6 µA]		
	1 kHz to 10 kHz	Q[0.58 %, 11 µA]		
	20 mA to 200 mA			
	10 Hz to 44 Hz	Q[0.24 %, 80 µA]		
	44 Hz to 1 kHz	Q[0.070 %, 72 µA]		
	1 kHz to 10 kHz	Q[0.70 %, 91 µA]		
	200 mA to 2 A			
	10 Hz to 44 Hz	Q[0.24 %, 0.8 mA]		
	44 Hz to 1 kHz	Q[0.070 %, 0.72 mA]		
	1 kHz to 5 kHz	Q[0.70 %, 0.91 mA]		
	2 A to 30 A			
	10 Hz to 44 Hz	Q[0.24 %, 8.0 mA]		
	44 Hz to 100 Hz	Q[0.11 %, 6.0 mA]		
	100 Hz to 1 kHz	Q[0.35 %, 5.8 mA]		
AC RESISTANCE				
Measurement	*At 25 Hz and 75 Hz*		Measurement of resistors using AC bridge.	P
	0 Ω to 400 Ω	Q[0.0012 %, 1.2 µΩ]		
Calibration of 16th/17th Edition electrical testers				
Loop Resistance (Generation)	0 Ω to 10 Ω	Q[0.58 %, 30 mΩ]	Known 50 Hz resistance values for application to loop testers.	
	10 Ω to 100 Ω	Q[0.58 %, 37 mΩ]		
	100 Ω to 1 kΩ	Q[0.58 %, 130 mΩ]		
Capacitance	*At 1 kHz:*		Known, fixed values of capacitance for application to capacitance measuring instruments.	P
	1 nF	44 pF		
	10 nF	74 pF		
	20 nF	115 pF		
	50 nF	255 pF		
	100 nF	0.4 nF		
	1 µF	5 nF		
	10 µF	73 nF		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
FREQUENCY				
Generation	10 Hz to 10 MHz	24 parts in 10^6	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	Q[0.12%, 3.8 mHz] Q[0.058 %, 0.93 mHz] Q[0.035 %, 0.97 mHz] Q[0.012 %, 2.6 mHz] Q[0.012 %, 11 mHz] Q[0.012 %, 0.27 Hz] Q[0.012 %, 0.27 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	0.20 °C 0.20°C	Including cold junction compensation	P and S
Noble metal thermocouples	0 °C to 600 °C 600 °C to 1800 °C	0.30 °C 0.30 °C	Including cold junction compensation	P and S
Resistance thermometers (Pt100)	-200 °C to +800 °C	0.012 °C to 0.043 °C	For 4-wire measurements. The quoted uncertainties may be increased for 2-wire configurations.	P and S
TIME INTERVAL				
Timers and stopwatches with mechanical or electrical triggering	10 s to 24 hrs	Q[3.6 parts in 10^6, 0.031 s]	Comparison with standard timer. The uncertainties quoted will be particularly dependent on the resolution and repeatability of the device being calibrated.	P and S
Manual start count up or count down timers.	10 s to 24 hrs	Q[1.1 parts in 10^6, 0.92 s]	Comparison with a 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 90000 rpm	0.13 % 0.063 % 0.037 % 0.013 %	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	
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	Instruments with an electrical output can be calibrated	
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 25 %rh 50 %rh 75 %rh 90 %rh	0.20 %rh 0.37 %rh 0.75 %rh 1.1 %rh 1.2 %rh		
At 20 °C	5 %rh 25 %rh 50 %rh 75 %rh 95 %rh	0.20 %rh 0.35 %rh 0.67 %rh 0.99 %rh 1.2 %rh		
At 50 °C	5 %rh 25 %rh 50 %rh 75 %rh 85 %rh	0.10 %rh 0.28 %rh 0.67 %rh 0.99 %rh 1.2 %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	-2 kPa to 2 kPa	Q[0.28 %, 1.6 Pa]	Instruments with an electrical output can be calibrated	P and S
	-100 kPa to +2.0 MPa	Q[0.0069 %, 55 Pa]		P
	-100 kPa to +2.0 MPa	Q[0.0070 %, 0.35 kPa]		S
Gauge gas absolute	90 Pa to 2.1 MPa	Q[0.0069 %, 59 Pa]	Achievable range may be reduced in the absence of a physical pressure port on the device	P
	75 kPa to 115 kPa	9.0 Pa		P
	75 kPa to 105 kPa	Q[0.018 %, 58 Pa]		S
	5 kPa to 2.1 MPa	Q[0.022 %, 0.40 kPa]		S
Gauge hydraulic pressure	2 MPa to 70 MPa	Q[0.018 %, 5.5 kPa]		P and S
TEMPERATURE			Unless otherwise stated calibration performed by comparison with reference thermometers	
Resistance Thermometers	-196 °C -100 °C to -80 °C -80 °C to 0 °C Ice point 0 °C 0.01 °C 0 °C to 70 °C 70 °C to 300 °C 300 °C to 660 °C	0.010 °C 0.036 °C 0.011 °C 0.010 °C 0.0023 °C 0.020 °C 0.014 °C 0.20 °C	Liquid Nitrogen. Metal Block Bath Liquid Baths Ice point Triple point of water Calibration performed within Liquid Baths Calibration performed within Metal Block Baths	P
Platinum thermocouples R and S	0 °C to 70 °C 70 °C to 300 °C 300 °C to 660 °C 660 °C to 1000 °C 1000 °C to 1350 °C 1350 °C to 1600 °C	0.45 °C 0.45 °C 0.44 °C 1.0 °C 1.0 °C 1.9 °C	Calibration performed within Metal Block Baths or within Tube Furnaces	P
Platinum thermocouples B	300 °C to 660 °C 660 °C to 1000 °C 1000 °C to 1350 °C 1350 °C to 1600 °C	0.74 °C 1.1 °C 1.1 °C 1.9 °C		
Other thermocouples	-196 °C -100 °C to -80 °C -80 °C to 0 °C 0 °C to 70 °C 70 °C to 300 °C 300 °C to 660 °C 660 °C to 1000 °C 1000 °C to 1350 °C	0.34 °C 0.20 °C 0.19 °C 0.17 °C 0.16 °C 0.25 °C 1.0 °C 1.0 °C	Liquid Nitrogen. Calibration performed within Metal Block Baths or within Tube Furnaces	P

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
TEMPERATURE (continued)				
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 1350 °C	0.25 °C 0.30 °C 0.20 °C 0.20 °C 1.0 °C 2.5 °C	Liquid Nitrogen. Calibration performed within block bath and Liquid Baths or within Tube Furnaces	S
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	-196 °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	-100 °C to 0 °C 0 °C to 300 °C 300 °C to 660 °C 660 °C to 1100 °C	0.21 °C 0.093 °C 0.20 °C 1.0 °C	Method consistent with Euramet cg13	P
Metal block calibrators	-50 °C to +300 °C 300 °C to 650 °C 650 °C to 1100 °C	0.21 °C 2.5 °C 4.0 °C	Method consistent with Euramet cg13	S
Radiation thermometers (pyrometers)	-50 °C to -30 °C -30 °C to 0 °C 0 °C to +18 °C 18 °C to 35 °C 35 °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 1200 °C to 1400 °C 1400 °C to 1500 °C	1.3 °C 0.50 °C 0.26 °C 0.44 °C 0.53 °C 0.57 °C 0.70 °C 0.86 °C 0.77 °C 0.78 °C 1.1 °C 1.3 °C 1.7 °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 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: $Q[a, b] = [a^2 + b^2]^{1/2}$