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Allied Aerosystems Ltd

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Avionic and Metrology Centre
Unit G1/2
Treforest Industrial Estate
Pontypridd
CF37 5YL

Contact: Mr P Ashurst
Tel: +44 (0)1443 849970
Fax: +44 (0)1443 849988
E-Mail: phillip.ashurst@allied-aerosystems.com
Website: www.allied-aerosystems.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 Avionic and Metrology Centre Unit G1/2 Treforest Industrial Estate Pontypridd CF37 5YL	**Local contact** Mr P Ashurst Tel: +44 (0)1443 849970 Fax: +44 (0)1443 849988 E-Mail: phillip.ashurst@allied-aerosystems.com	Electrical, DC and LF Electrical, RF Rotational speed Time	Lab 1
Address Units 1-6, Moy Road Industrial Estate Taffs Well Cardiff CF15 7QR	**Local contact** All correspondence and deliveries are to be made to the above address	Dimensional Torque Mass Temperature Relative Humidity Pressure Surface plates and tables Accelerometry	Lab 2

Site activities performed away from the locations listed above:

Location details	Activity	Location code
Customers' Premises 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.	Non-automatic weighing instruments Surface plates and tables Temperature Pressure	Site

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION				
DC VOLTAGE				Lab 1
	0 mV to 220 mV	8.4 µV/V + 0.60 µV	Using multifunction calibrator.	
	220 mV to 2.2 V	7.0 µV/V + 1.0 µV		
	2.2 V to 11 V	7.0 µV/V + 3.6 µV		
	11 V to 22 V	7.0 µV/V + 6.6 µV		
	22 V to 220 V	8.0 µV/V + 80 µV		
	220 V to 1100 V	9.0 µV/V +560 µV		
	0 mV to 200 mV	5.2 µV/V + 1.2 µV	Using digital multimeter	
	200 mV to 2 V	3.3 µV/V + 0.59 µV		
	2 V to 20 V	3.2 µV/V + 5.1 µV		
	20 V to 200 V	4.7 µV/V + 51 µV		
	200 V to 1 kV	15 µV/V + 0.29 mV		
DC CURRENT	0 µA to 220 µA	50 µA/A + 8.0 nA	Using multifunction calibrator.	Lab 1
	220 µA to 2.2 mA	50 µA/A + 8.0 nA		
	2.2 mA to 22 mA	50 µA/A + 100 nA		
	22 mA to 220 mA	60 µA/A + 800 nA		
	220 mA to 2.2 A	81 µA/A + 25 µA		
	2.2 A to 11 A	0.080 % + 0.39 mA		
	11 A to 20 A	0.10 % + 4.6 mA		
	20 A to 100 A	0.10 % + 23 mA		
	11 A to 16.5 A	0.30 % + 2.4 mA	Simulated current using a multi turn coil, for the calibration of clamp-on ammeters and similar devices.	
	16.5 A to 150 A	0.30 % + 18 mA		
	150 A to 1025 A	0.30 % + 61 mA		
	0 µA to 200 µA	10 µA/A + 0.48 nA	Using digital multimeter.	
	200 µA to 2 mA	10 µA/A + 4.7 nA		
	2 mA to 20 mA	10 µA/A + 47 nA		
	20 mA to 200 mA	39 µA/A + 0.93 µA		
	200 mA to 2 A	200 µA/A + 16 µA		
	2.0 A to 20 A	440 µA/A + 51 µA		
	20 A to 100 A	0.11 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
DC RESISTANCE				Lab 1
Specific values	0 Ω	59 µΩ	Known values of DC resistance for application to measuring instruments in a 2-wire or 4-wite configuartion, as appropriate.	
	1 mΩ	100 µΩ/Ω		
	10 mΩ	100 µΩ/Ω		
	100 mΩ	100 µΩ/Ω		
	1.0 Ω	110 µΩ/Ω		
	1.9 Ω	98 µΩ/Ω		
	10 Ω	31 µΩ/Ω		
	19 Ω	37 µΩ/Ω		
	100 Ω	18 µΩ/Ω		
	190 Ω	18 µΩ/Ω		
	1.0 kΩ	14 µΩ/Ω		
	1.9 kΩ	14 µΩ/Ω		
	10 kΩ	12 µΩ/Ω		
	19 kΩ	13 µΩ/Ω		
	100 kΩ	15 µΩ/Ω		
	190 kΩ	16 µΩ/Ω		
	1.0 MΩ	25 µΩ/Ω		
	1.9 MΩ	30 µΩ/Ω		
	10 MΩ	54 µΩ/Ω		
	19 MΩ	68 µΩ/Ω		
	100 MΩ	110 µΩ/Ω		
	0 Ω to 2 Ω	12 µΩ/Ω + 5.0 µΩ	Using digital multimeter; for the calibration of resistors and resistance boxes.	
	2 Ω to 20 Ω	8.5 µΩ/Ω + 21 µΩ		
	20 Ω to 200 Ω	8.5 µΩ/Ω + 70 µΩ		
	200 Ω to 2 kΩ	8.4 µΩ/Ω + 0.62 mΩ		
	2 kΩ to 20 kΩ	8.4 µΩ/Ω + 6.2 mΩ		
	20 kΩ to 200 kΩ	8.6 µΩ/Ω + 62 mΩ		
	200 kΩ to 2 MΩ	9.9 µΩ/Ω + 1.4 Ω		
	2 MΩ to 20 MΩ	16 µΩ/Ω + 120 Ω		
	20 MΩ to 200 MΩ	68 µΩ/Ω + 670 Ω		
	200 MΩ to 2 GΩ	0.060 % + 1.2 MΩ		
AC VOLTAGE	*10 Hz to 20 Hz*		Using multifunction calibrator.	Lab 1
	1 mV to 2.2 mV	0.071 % + 4.6 µV		
	2.2 mV to 22 mV	0.057 % + 5.0 µV		
	22 mV to 220 mV	0.057 % + 13 µV		
	220 mV to 2.2 V	0.051 % + 80 µV		
	2.2 V to 22 V	0.051 % + 810 µV		
	22 V to 220 V	0.051 % + 8.1 mV		
	20 Hz to 40 Hz			
	1 mV to 2.2 mV	0.050 % + 4.5 µV		
	2.2 mV to 22 mV	0.023 % + 5.0 µV		
	22 mV to 220 mV	0.022 % + 8.0 µV		
	220 mV to 2.2 V	0.017 % + 25 µV		
	2.2 V to 22 V	0.017 % + 250 µV		
	22 V to 220 V	0.017 % + 2.6 mV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
AC VOLTAGE (continued)	*40 Hz to 20 kHz*		Using multifunction calibrator.	Lab 1
	1 mV to 2.2 mV	0.046 % + 4.5 µV		
	2.2 mV to 22 mV	0.014 % + 5.0 µV		
	22 mV to 220 mV	0.0090 % + 1.0 µV		
	220 mV to 2.2 V	0.0090 % + 7.0 µV		
	2.2 V to 22 V	0.0090 % + 62 µV		
	22 V to 220 V	0.0090 % + 1.0 mV		
	50 Hz to 1 kHz			
	220 V to 1100 V	0.010 % + 5.0 mV		
	20 kHz to 50 kHz			
	1 mV to 2.2 mV	0.058 % + 6.0 uV		
	2.2 mV to 22 mV	0.039 % + 7.0 uV		
	22 mV to 220 mV	0.033 % + 8.0 uV		
	220 mV to 2.2 V	0.013 % + 17 uV		
	2.2 V to 22 V	0.013 % + 170 µV		
	22 V to 220 V	0.023 % + 3.5 mV		
	50 kHz to 100 kHz			
	1 mV to 2.2 mV	0.10 % + 7.0 uV		
	2.2 mV to 22 mV	0.090 % + 7.0 uV		
	22 mV to 220 mV	0.090 % + 25 uV		
	220 mV to 2.2 V	0.025 % + 70 uV		
	2.2 V to 22 V	0.025 % + 350 µV		
	22 V to 220 V	0.050 % + 8.0 mV		
	100 kHz to 300 kHz			
	1 mV to 2.2 mV	0.12 % + 13 uV		
	2.2 mV to 22 mV	0.11 % + 12 uV		
	22 mV to 220 mV	0.11 % + 25 uV		
	220 mV to 2.2 V	0.050 % + 140 µV		
	2.2 V to 22 V	0.050 % + 1.5 mV		
	300 kHz to 500 kHz			
	1 mV to 2.2 mV	0.18 % + 25 uV		
	2.2 mV to 22 mV	0.17 % + 25 uV		
	22 mV to 220 mV	0.17 % + 35 uV		
	220 mV to 2.2 V	0.11 % + 360 µV		
	2.2 V to 22 V	0.13 % + 4.3 mV		
	500 kHz to 1 MHz			
	1 mV to 2.2 mV	0.35 % + 25 uV		
	2.2 mV to 22 mV	0.34 % + 25 uV		
	22 mV to 220 mV	0.34 % + 80 µV		
	220 mV to 2.2 V	0.22 % + 850 µV		
	2.2 V to 22 V	0.27 % + 8.5 mV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC VOLTAGE (continued)	*10 Hz to 20 Hz*		Using digital multimeter.	Lab 1
	1.3 µV to 2.2 mV	0.010 % 1.3 uV		
	2.2 mV to 7 mV	70 µV/V + 1.8 uV		
	7 mV to 22 mV	60 µV/V + 2.1 uV		
	22 mV to 70 mV	50 µV/V + 1.5 uV		
	70 mV to 220 mV	50 µV/V + 2.4 uV		
	220 mV to 700 mV	50 µV/V + 11 uV		
	700 mV to 2.2 V	50 µV/V + 23 uV		
	2.2 V to 7 V	50 µV/V + 0.11 mV		
	7 V to 22 V	50 µV/V + 0.3 mV		
	22 V to 70 V	50 µV/V + 1.7 mV		
	70 V to 220 V	50 µV/V + 3.7 mV		
	20 Hz to 40 Hz			
	2 µV to 2.2 mV	50 µV/V + 2.0 uV		
	2.2 mV to 7 mV	50 µV/V + 2.2 uV		
	7 mV to 22 mV	50 µV/V + 2.1 uV		
	22 mV to 70 mV	30 µV/V + 2.2 uV		
	70 mV to 220 mV	30 µV/V + 3 uV		
	220 mV to 700 mV	30 µV/V + 10.5 uV		
	700 mV to 2.2 V	30 µV/V + 14.6 uV		
	2.2 V to 7 V	30 µV/V + 30.3 µV		
	7 V to 22 V	30 µV/V + 0.28 mV		
	22 V to 70 V	30 µV/V + 0.55 mV		
	70 V to 220 V	30 µV/V + 2.0 mV		
	40 Hz to 20 kHz			
	1.3 µV to 2.2 mV	40 µV/V + 1.3 uV		
	2.2 mV to 7 mV	30 µV/V + 1.5 uV		
	7 mV to 22 mV	30 µV/V + 1.8 uV		
	22 mV to 70 mV	20 µV/V + 1.7 uV		
	70 mV to 220 mV	20 µV/V + 2.5 uV		
	220 mV to 700 mV	20 µV/V + 13 uV		
	700 mV to 2.2 V	20 µV/V + 12 uV		
	2.2 V to 7 V	20 µV/V + 44 µV		
	7 V to 22 V	20 µV/V + 81 µV		
	22 V to 70 V	20 µV/V + 0.13 mV		
	70 V to 220 V	40 µV/V + 0.90 mV		
	100 Hz to 20 kHz			
	220 V to 700 V	20 µV/V + 12 mV		
	700 V to 1100	20 µV/V + 20 mV		
	20 kHz to 50 kHz			
	1.8 µV to 2.2 mV	50 µV/V + 1.8 uV		
	2.2 mV to 7 mV	40 µV/V + 1.9 uV		
	7 mV to 22 mV	40 µV/V + 2.1 uV		
	22 mV to 70 mV	30 µV/V + 3.2 uV		
	70 mV to 220 mV	20 µV/V + 4 uV		
	220 mV to 700 mV	20 µV/V + 7 uV		
	700 mV to 2.2 V	20 µV/V + 15 uV		
	2.2 V to 7 V	20 µV/V + 25 µV		
	7 V to 22 V	20 µV/V + 41 µV		
	22 V to 70 V	30 µV/V + 0.61 mV		
	70 V to 220 V	30 µV/V + 1.9 mV		
	220 V to 700 V	90 µV/V + 15 mV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
AC VOLTAGE (continued)	*50 kHz to 100 kHz*		Using digital multimeter.	Lab 1
	2.2 µV to 2.2 mV	70 µV/V + 2.2 uV		
	2.2 mV to 7 mV	50 µV/V + 2.2 uV		
	7 mV to 22 mV	70 µV/V + 2.5 uV		
	22 mV to 70 mV	70 µV/V + 4.4 uV		
	70 mV to 220 mV	50 µV/V + 9.3 uV		
	220 mV to 700 mV	50 µV/V + 3.7 uV		
	700 mV to 2.2 V	50 µV/V + 25 uV		
	2.2 V to 7 V	60 µV/V + 31 µV		
	7 V to 22 V	60 µV/V + 21 µV		
	22 V to 70 V	60 µV/V + 4.0 mV		
	70 V to 220 V	60 µV/V + 9.1 mV		
	220 V to 700 V	0.040 % + 17 mV		
	100 kHz to 300 kHz			
	5.7 µV to 2.2 mV	0.017 % + 5.7 uV		
	2.2 mV to 7 mV	0.010 % + 5.8 uV		
	7 mV to 22 mV	0.0090 % + 5.8 uV		
	22 mV to 70 mV	0.010 % + 6.9 uV		
	70 mV to 220 mV	0.0090 % + 11 uV		
	220 mV to 700 mV	0.0090 % + 9 uV		
	700 mV to 2.2 V	0.0080 % + 24 uV		
	2.2 V to 7 V	0.012 % + 67 µV		
	7 V to 22 V	0.012 % + 21 µV		
	22 V to 70 V	0.012 % + 7.0 mV		
	300 kHz to 500 kHz			
	6 µV to 2.2 mV	0.051 % + 6.0 uV		
	2.2 mV to 7 mV	0.032 % + 7.0 uV		
	7 mV to 22 mV	0.027 % + 9.0 uV		
	22 mV to 70 mV	0.023 % + 22 uV		
	70 mV to 220 mV	0.022 % + 9.0 uV		
	220 mV to 700 mV	0.022 % + 34 uV		
	700 mV to 2.2 V	0.019 % + 17 uV		
	2.2 V to 7 V	0.030 % + 0.18 mV		
	7 V to 22 V	0.030 % + 0.20 mV		
	500 kHz to 1 MHz		Using digital multimeter.	
	7 µV to 2.2 mV	0.19 % + 7.0 uV		
	2.2 mV to 7 mV	0.14 % + 7.0 uV		
	7 mV to 22 mV	0.11 % + 9.0 uV		
	22 mV to 70 mV	0.11 % + 21 uV		
	70 mV to 220 mV	0.080 % + 7.0 uV		
	220 mV to 700 mV	0.080 % + 33 uV		
	700 mV to 2.2 V	0.070 % + 21 uV		
	2.2 V to 7 V	0.10 % + 0.34 mV		
	7 V to 22 V	0.10 % + 0.26 mV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
AC CURRENT	*45 Hz to 1 kHz*			Lab 1
	22 µA to 220 µA	0.021 % + 16 nA	Using multifunction calibrator.	
	220 µA to 2.2 mA	0.018 % + 35 nA		
	2.2 mA to 22 mA	0.014 % + 370 nA		
	22 mA to 220 mA	0.014 % + 3.6 µA		
	220 mA to 2.2 A	0.065 % + 42 µA		
	45 Hz to 100 Hz			
	2.2 A to 11 A	0.070 % + 2.4 mA		
	11 A to 20 A	0.14 % + 5.8 mA		
	20 A to 100 A	0.27 % + 120 mA		
	100 Hz to 1 kHz			
	2.2 A to 11 A	0.070 % + 2.4 mA		
	11 A to 20 A	0.17 % + 24 mA		
	45 Hz to 65 Hz			
	11 A to 16.5 A	0.40 % + 3.5 mA	Simulated current using a multi turn coil, for the calibration of clamp-on ammeters and similar devices.	
	16.5 A to 150 A	0.40 % + 29 mA		
	150 A to 1025 A	0.40 % + 110 mA		
	65 Hz to 440 Hz			
	11 A to 16.5 A	1.0 % + 4.0 mA	Simulated current using a multi turn coil, for the calibration of clamp-on ammeters and similar devices.	
	16.5 A to 150 A	1.0 % + 32 mA		
	150 A to 1025 A	1.0 % + 120 mA		
	1 kHz to 5 kHz			
	22 µA to 220 µA	0.064 % + 40 nA		
	220 µA to 2.2 mA	0.062 % + 400 nA		
	2.2 mA to 22 mA	0.060 % + 4.0 µA		
	22 mA to 220 mA	0.060 % + 40 µA		
	220 mA to 2.2 A	0.075 % + 80 µA		
	5 kHz to 10 kHz			
	22 µA to 220 µA	0.17 % + 120 nA		
	220 µA to 2.2 mA	0.17 % + 800 nA		
	2.2 mA to 22 mA	0.16 % + 8.0 µA		
	22 mA to 220 mA	0.16 % + 80 µA		
	220 mA to 2.2 A	0.85 % + 160 µA		
	50 Hz to 1 kHz		Using digital multimeter.	
	1 µA to 200 µA	0.034 % + 26 nA		
	200 µA to 2 mA	0.033 % + 0.26 µA		
	2 mA to 20 mA	0.033 % + 2.6 µA		
	20 mA to 200 mA	0.034 % + 26 µA		
	200 mA to 2 A	0.078 % + 0.26 mA		
	2 A to 20 A	0.11 % + 2.6 mA		
	50 Hz to 60 Hz			
	20 A to 100 A	0.17 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
AC CURRENT (continued)	*1 kHz to 5 kHz*		Using digital multimeter.	Lab 1
	1 µA to 200 µA	0.036 % + 26 nA		
	200 µA to 2 mA	0.033 % + 0.26 µA		
	2 mA to 20 mA	0.033 % + 6.4 µA		
	20 mA to 200 mA	0.034 % + 26 µA		
	200 mA to 2 A	0.090 % + 0.27 mA		
	2 A to 20 A	0.33 % + 2.6 mA		
	5 kHz to 10 kHz			
	1 µA to 200 µA	0.052 % + 26 nA		
	200 µA to 2 mA	0.034 % + 0.26 µA		
	2 mA to 20 mA	0.033 % + 6.4 µA		
	20 mA to 200 mA	0.034 % + 26 µA		
	200 mA to 2 A	0.091 % + 0.27 mA		
	2 A to 20 A	0.38 % + 2.0 mA		
DC POWER				Lab 1
0.1 mW to 100 kW	33 mV to 1020 V			
	3.3 mA to 9 mA	0.040 %	For voltages in the range 33 mV to 1020 V.	
	9 mA to 33 mA	0.030 %		
	33 mA to 90 mA	0.040 %		
	90 mA to 330 mA	0.030 %		
	330 mA to 900 mA	0.080 %		
	900 mA to 2.2 A	0.060 %		
	2.2 A to 4.5 A	0.12 %		
	4.5 A to 11 A	0.090 %		
	11 A to 20.5 A	0.13 %		
	20.5 A to 100 A	0.13 %		
0.1 W to 1 MW				
	10 A to 16.5 A	0.25 %	For voltages in the range 33 mV to 1020 V; clamp meter calibrations.	
	16.5 A to 110 A	0.27 %		
	110 A to 150 A	0.28 %		
	150 A to 1000 A	0.31 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
AC POWER			By phantom load technique at unity power factor.	Lab 1
0.1 mW to 100 kW 45 Hz to 65 Hz	33 mV to 330 mV *3.3 mA to 9 mA* *9 mA to 33 mA* *33 mA to 90 mA* *90 mA to 330 mA* *330 mA to 900 mA* *900 mA to 2.2 A* *2.2 A to 4.5 A* *4.5 A to 11 A* *11 A to 20.5 A* *20.5 A to 100 A* 330 mV to 1020 V *3.3 mA to 9 mA* *9 mA to 33 mA* *33 mA to 90 mA* *90 mA to 330 mA* *330 mA to 900 mA* *900 mA to 2.2 A* *2.2 A to 4.5 A* *4.5 A to 11 A* *11 A to 20.5 A* *20.5 A to 100 A*	 0.40 % 0.25 % 0.35 % 0.25 % 0.35 % 0.25 % 0.35 % 0.30 % 0.22 % 0.90 % 0.25 % 0.15 % 0.25 % 0.15 % 0.25 % 0.15 % 0.30 % 0.30 % 0.22 % 0.90 %		
0.1 W to 1 MW	33 mV to 1020 V *10 A to 16.5 A* *16.5 A to 110 A* *110 A to 150 A* *150 A to 1000 A*	 0.32 % 0.34 % 0.34 % 0.43 %	Clamp meter calibrations.	
PHASE ANGLE				Lab 1
Voltage:Current	0º to 360º *10 Hz to 65 Hz* *65 Hz to 400 Hz*	 0.18º 1.0º	For applied currents in the range 3.3 mA to 20.5 A and applied voltages in the range 33 mV to 1020 V	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION (continued)				
CAPACITANCE				Lab 1
Calibration of capacitance meters			Using multifunction calibrator.	
	10 Hz to 10 kHz 220 pF to 1.0999 nF	0.39 % + 9.8 pF	The frequency ranges shown are for the test frequencies for conventional LCR meters or for the sample rate of capacitance meters that operate using the principle $C = I\Delta t / \Delta V$.	
	10 Hz to 3 kHz 1.1 nF to 3.2999 nF	0.39 % + 9.8 pF		
	10 Hz to 1 kHz 3.3 nF to 10.999 nF 11 nF to 32.999 nF 33 nF to 109.99 nF 110 nF to 329.99 nF	0.20 % + 13 pF 0.20 % + 0.10 nF 0.20 % + 0.13 nF 0.20 % + 0.42 nF		
	10 Hz to 600 Hz 0.33 µF to 1.0999 µF	0.20 % + 2.8 nF		
	10 Hz to 300 Hz 1.1 µF to 3.2999 µF	0.20 % + 3.9 nF		
	10 Hz to 150 Hz 3.3 µF to 10.999 µF	0.20 % + 13 nF		
	10 Hz to 120 Hz 11 µF to 32.999 µF	0.31 % + 52 nF		
	10 Hz to 80 Hz 33 µF to 109.99 µF	0.35 % + 0.18 µF		
	DC to 50 Hz 110 µF to 329.99 µF	0.35 % + 0.65 µF	The frequency ranges shown are for the sample rate of capacitance meters that operate using the principle $C = I\Delta t / \Delta V$.	
	DC to 20 Hz 0.33 mF to 1.0999 mF	0.35 % + 1.2 µF		
	DC to 6 Hz 1.1 mF to 3.2999 mF	0.35 % + 6.5 µF		
	DC to 2 Hz 3.3 mF to 10.999 mF	0.34 % + 12 µF		
	DC to 0.6 Hz 11 mF to 32.999 mF	0.58 % + 68 µF		
	DC to 0.2 Hz 33 mF to 110 mF	0.85 % + 0.13 mF		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Calibration of 17th/18th Edition Test Equipment				Lab 1
INSULATION TESTERS				
Continuity	0 Ω to 100 mΩ 100 mΩ to 500 mΩ 0.5 Ω to 1 Ω 1 Ω to 5 Ω 5 Ω to 200 Ω 200 Ω to 10 kΩ	5.0 mΩ 1.1 % + 12 mΩ 0.53 % + 12 mΩ 0.46 % + 12 mΩ 0.25 % + 12 mΩ 0.25 %	Applied resistances of known value.	
High Resistance	10 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 1 GΩ 1 GΩ to 10 GΩ	0.24 % 0.35 % 0.6 % 1.3 %	Applied resistances of known value. Uncertainty increases by 0.10 % per 200 V above 500 V.	
Test Voltage Measurement	0 V to 2 kV DC *10 kΩ to 1 MΩ load* *1 MΩ to 10 GΩ load*	 1.0 % + 2.0 V 1.0 % + 5.0 V	 By voltage measurement.	
LINE / LOOP IMPEDANCE TESTERS				
Resistance (nominal values)	25 mΩ 50 mΩ 100 mΩ 330 mΩ 500 mΩ 1 Ω 1.8 Ω 5 Ω 10 Ω 18 Ω 50 Ω 100 Ω 180 Ω 500 Ω 1 kΩ 1.8 kΩ	6.0 mΩ 6.0 mΩ 6.0 mΩ 9.0 mΩ 10 mΩ 12 mΩ 22 mΩ 36 mΩ 0.070 Ω 0.12 Ω 0.35 Ω 0.59 Ω 1.2 Ω 3.0 Ω 5.9 Ω 12 Ω	At 50 Hz nominal	
Current	0.05 A 0.1 A 0.25 A 0.5 A 0.8 A 1.5 A 2.0 A 3.2 A 6 A 8 A 10 A 14 A 25 A 28 A 30 A	1.5 % + 2.0 mA 1.5 % + 3.0 mA 1.5 % + 5.0 mA 1.5 % + 10 mA 1.5 % + 20 mA 1.5 % + 30 mA 1.5 % + 50 mA 1.5 % + 70 mA 1.5 % + 100 mA 1.5 % + 150 mA 1.5 % + 0.20 A 1.5 % + 0.30 A 1.5 % + 0.35 A 1.5 % + 0.50 A 1.5 % + 0.70 A	50 Hz nominal	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
RCD TESTERS				
Timing	10 ms to 5 s	0.024 % + 0.32 ms		
Current				
0.5 x I and 1 x I Mode				
	3 mA to 30 mA	1.3 % + 1.3 µA		
	30 mA to 300 mA	1.3 % + 14 µA		
	300 mA to 3000 mA	1.3 % + 0.13 mA		
1.4 x I and 2 x I Mode				
	3 mA to 30 mA	2.6 % + 1.3 µA		
	30 mA to 300 mA	2.6 % + 14 µA		
	300 mA to 1500 mA	2.6 % + 0.13 mA		
5 x I Mode				
	3 mA to 30 mA	6.4 % + 1.3 µA		
	30 mA to 300 mA	6.4 % + 14 µA		
	300 mA to 600 mA	6.4 % + 0.13 mA		
LEAKAGE TESTERS				
Current				
Passive/Differential/Substitute Modes	0.1 mA to 30 mA	0.30 % + 2.0 µA (ac + dc) rms		
Active Mode				
	0.1 mA to 30 mA	0.30 % + 1.0 µA (ac + dc) rms		
Touch Voltage	250 V Range	5.0 % + 3.0 V		
PORTABLE APPLIANCE TESTERS				Lab 1
Earth Bond Resistance.	25 mΩ	6.0 mΩ	Nominal values at 50 Hz to 60 Hz	
	50 mΩ	6.0 mΩ		
	100 mΩ	6.0 mΩ		
	330 mΩ	9.0 mΩ		
	500 mΩ	10 mΩ		
	1 Ω	12 mΩ		
	1.8 Ω	22 mΩ		
	5 Ω	36 mΩ		
	10 Ω	70 mΩ		
	18 Ω	0.12 Ω		
	50 Ω	0.35 Ω		
	100 Ω	0.59 Ω		
	180 Ω	1.2 Ω		
	500 Ω	3.0 Ω		
	1 kΩ	5.9 Ω		
	1.8 kΩ	12 Ω		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
PORTABLE APPLIANCE TESTERS (continued)				Lab 1
Earth Bond Current At 50 Hz to 60 Hz				
	0.05 A	1.5 % + 2.0 mA		
	0.1 A	1.5 % + 3.0 mA		
	0.25 A	1.5 % + 5.0 mA		
	0.5 A	1.5 % + 10 mA		
	0.8 A	1.5 % + 20 mA		
	1.5 A	1.5 % + 30 mA		
	2.0 A	1.5 % + 50 mA		
	3.2 A	1.5 % + 70 mA		
	6 A	1.5 % + 100 mA		
	8 A	1.5 % + 150 mA		
	10 A	1.5 % + 0.20 A		
	14 A	1.5 % + 0.30 A		
	25 A	1.5 % + 0.35 A		
	28 A	1.5 % + 0.50 A		
	30 A	1.5 % + 0.70 A		
Insulation Resistance	10 kΩ to 1 MΩ	0.24 %	Applied resistances of known value. Uncertainty increases by 0.10 % per 200 V above 500 V.	
	1 MΩ to 10 MΩ	0.35 %		
	10 MΩ to 1 GΩ	0.60 %		
	1 GΩ to 10 GΩ	1.3 %		
Test Voltage	0 V to 2 kV DC		By voltage measurement.	
	10 kΩ to 1 MΩ load	1.0 % + 2.0 V		
	1 MΩ to 10 GΩ load	1.0 % + 5.0 V		
Continuity	100 mΩ to 500 mΩ	1.1 % + 12 mΩ		
	0.5 Ω to 1 Ω	0.53 % + 12 mΩ		
	1 Ω to 5 Ω	0.46 % + 12 mΩ		
	5 Ω to 200 Ω	0.25 % + 12 mΩ		
	200 Ω to 10 kΩ	0.25 %		
HIPOT/HV TESTERS				
HVDC Voltage	0.1 kV to 10 kV	0.35 % + 7.0 V		
	10 kV to 20 kV	2.4 % + 46 V		
	20 kV to 35 kV	1.3 % + 78 V		
	35 kV to 40 kV	2.4 % + 97 V		
HVAC Peak Voltage	*50 Hz / 60 Hz*			
	100 V to 10 kV	0.60 % + 19 V		
	10 kV to 40 kV	5.8 % + 100 V		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
HIPOT/HV TESTERS (continued)				Lab 1
DC Leakage Current	0 A to 300 µA 0.3 mA to 3 mA 3 mA to 30 mA 30 mA to 300 mA	0.37 % + 0.26 µA 0.24 % + 1.9 µA 0.24 % + 19 µA 0.24 % + 0.19 mA		
AC Leakage Current	*20 Hz to 400 Hz* 0 A to 300 µA 0.3 mA to 3 mA 3 mA to 30 mA 30 mA to 300 mA	 0.37 % + 0.26 µA 0.24 % + 1.9 µA 0.24 % + 19 µA 0.24 % + 0.19 mA		
FREQUENCY	1 Hz to 10 Hz 10 Hz to 100 Hz 100 Hz to 1 kHz 1kHz to 10kHz 10 kHz to 100 kHz 100 kHz to 10 MHz 10 MHz to 100 MHz 100 MHz to 1 GHz 1 GHz to 10 GHz 10 GHz to 20 GHz	2.0 in 10^6 1.0 in 10^6 1.0 in 10^7 1.0 in 10^8 1.0 in 10^9 1.0 in 10^9 1.6 in 10^{10} 19 in 10^{12} 15 in 10^{12} 2.8 in 10^{12}	Results and uncertainties may be quoted as average periodic time for repetitive events.	
TEMPERATURE SIMULATION				Lab 1
Electrical calibration of temperature indicators and simulators				
Resistance thermometers (Pt 100)	-200 ºC to +400 ºC 400 ºC to 800 ºC	0.070 ºC 0.070 ºC	By resistance simulation. Other RTD types can be calibrated but may attract larger uncertainties	
Thermocouples				
Type J	-250 ºC to -100 °C -100 °C to -30 °C -30 °C to +190 °C 190 °C to 1200 °C	0.14 °C 0.080 °C 0.074 °C 0.070 °C	By millivolt simulation, including cold junction compensation.	
Type K	-200 ºC to -100 °C -100 °C to -25 °C -25 °C to +250 °C 250 °C to 1000 °C 1000 °C to 1372 °C	0.41 °C 0.37 °C 0.36 °C 0.36 °C 0.36 °C		
Type R	-50 ºC to +50 ºC 50 ºC to 270 ºC 270 ºC to 1768 ºC	0.50 ºC 0.36 ºC 0.25 ºC		
Type T	-200 ºC to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 ° to 400 °C	0.16 °C 0.12 °C 0.082 °C 0.074 °C		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
TIME INTERVAL				Lab 1
Elapsed Time	1 s to 24 hrs	0.22 s	Mechanically triggered. The quoted uncertainty is particularly dependent on the resolution of the timer being calibrated.	
		0.0010 s	Electronically triggered	
ROTATIONAL SPEED				Lab 1
Tachometers	60 rpm to 1 000 rpm 1 000 rpm to 10 000 rpm 10 000 rpm to 120 000 rpm	0.12 rpm 0.13 rpm to 0.65 rpm 0.65 rpm to 1.7 rpm	Optical or electrically triggered devices. Mechanical tachometers will attract a larger uncertainty due to resolution.	
VOLTAGE REFLECTION COEFFICIENT	0 to 1 *10 MHz to 8 GHz* *8 GHz to 18 GHz*	 0.030 0.070	Using R & S ZNB-20 The uncertainties are quoted for 50 Ω systems for devices fitted only with Type N Connectors. Results and uncertainties may also be quoted in units of Return Loss (dB) or VSWR .	Lab 1
RF ATTENUATION	*10 MHz to 4 GHz* 0 dB to 10 dB 10 dB to 40 dB 40 dB to 50 dB 50 dB to 70 dB 70 dB to 90 dB *4 GHz to 12 GHz* 0 dB to 10 dB 10 dB to 20 dB 20 dB to 30 dB 30 dB to 40 dB 40 dB to 50 dB *12 GHz to 18 GHz* 0 dB to 10 dB 10 dB to 20 dB 20 dB to 30 dB 30 dB to 40 dB 40 dB to 50 dB	 0.036 dB 0.040 dB 0.050 dB 0.080 dB 0.090 dB 0.043 dB 0.040 dB 0.050 dB 0.040 dB 0.060 dB 0.16 dB 0.16 dB 0.15 dB 0.16 dB 0.24 dB	Using R & S ZNB-20 The uncertainties are quoted for 50 Ω systems for devices fitted only with Type N Connectors which present a near match to the 50 Ω measurement system. Measurement of devices presenting a significant mismatch will receive much larger uncertainties.	Lab 1

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
RF POWER Reference	1 mW Reference *50 MHz*	0.0063 mW		Lab 1
RF POWER			Note: These uncertainties are for type N systems with a source VSWR of 1.20:1 or less. Measurement of devices with a higher mismatch will receive higher measurement uncertainties.	Lab 1
	100 kHz to 300 kHz		Using 438A Power Meter and 8482A Sensor.	
	+20 dBm to +10 dBm	0.21 dB		
	+10 dBm to -25 dBm	0.16 dB		
	300 kHz to 1 MHz			
	+20 dBm to +10 dBm	0.16 dB		
	+10 dBm to -25 dBm	0.10 dB		
	1 MHz to 100 MHz		Using 438A Power Meter and 8482A Sensor	
	+20 dBm to +10 dBm	0.15 dB		
	+10 dBm to -25 dBm	0.090 dB		
	100 MHz to 3 GHz			
	+20 dBm to +10 dBm	0.16 dB		
	+10 dBm to -25 dBm	0.090 dB		
	3 GHz to 4.2 GHz			
	+20 dBm to +10 dBm	0.17 dB		
	+10 dBm to -25 dBm	0.11 dB		
	10 MHz to 30 MHz		Using 438A Power Meter and 8481A Sensor	
	+20 dBm to +10 dBm	0.16 dB		
	+10 dBm to -25 dBm	0.10 dB		
	30 MHz to 3.9 GHz			
	+20 dBm to +10 dBm	0.15 dB		
	+10 dBm to -25 dBm	0.080 dB		
	4 GHz to 18 GHz			
	+20 dBm to +10 dBm	0.16 dB		
	+10 dBm to -25 dBm	0.10 dB		
	10 MHz to 30 MHz		Using 438A Power Meter and 8484A Sensor	
	-20 dBm to -30 dBm	0.14 dB		
	-30 dBm to -60 dBm	0.19 dB		
	30 MHz to 3.9 GHz			
	-20 dBm to -30 dBm	0.13 dB		
	-30 dBm to -60 dBm	0.12 dB		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
RF POWER (continued)	*4 GHz to 12 GHz*			Lab 1
	-20 dBm to -30 dBm	0.14 dB		
	-30 dBm to -60 dBm	0.14 dB		
	12 GHz to 18 GHz			
	-20 dBm to -30 dBm	0.15 dB		
	-30 dBm to -60 dBbm	0.15 dB		
	10 MHz to 50 MHz		Using ML2437A Power Meter	
	+20 dBm to -60 dBm	0.13 dB	and MA 2481B Sensor	
	50 MHz to 3 GHz			
	+20 dBm to -60 dBm	0.10 dB		
	3 GHz to 6 GHz			
	+20 dBm to -60 dBm	0.11 dB		
	10 MHz to 6.6 GHz		N5531S Measuring Receiver	
	0 dBm to -50 dBm	0.088 dB	& Sensor Module	Lab 1
	-50 dBm to -70 dBm	0.091 dB		
	-70 dBm to -100 dBm	0.096 dB		
	-100 dBm to -130 dBm	0.10 dB		
	6.6 GHz to 13.2 GHz			
	0 dBm to -40 dBm	0.13 dB		
	-40 dBm to -60 dBm	0.13 dB		
	-60 dBm to -90 dBm	0.13 dB		
	-90 dBm to -120 dBm	0.14 dB		
	13.2 GHz to 18 GHz			
	0 dBm to -30 dBm	0.13 dB		
	-30 dBm to -50 dBm	0.13 dB		
	-50 dBm to -90 dBm	0.13 dB		
	-90 dBm to -120 dBm	0.14 dB		
	2.5 MHz to 1.3 GHz		Tuned RF Level using 8902A	
	0 dBm to -30 dBm	0.14 dB	measuring receiver	
	-30 dBm to -80 dBm	0.13 dB		
	-80 dBm to -120 dBm	0.16 dB		
	-120 dBm to -130 dBm	0.23 dB		
RF PEAK POWER	+20 dBm to -40 dBm		For the calibration of pulsed	Lab 1
	500 MHz to 800 MHz	0.10 dB	RF sources and generators	
	800 MHz to 1 GHz	0.11 dB	using 4541 Peak Power Meter	
	1 GHz to 1.6 GHz	0.12 dB	& 57006 Sensor	
	1.6 GHz to 2.5 GHz	0.13 dB		
	2.5 GHz to 3.2 GHz	0.12 dB		
	3.2 GHz to 3.6 GHz	0.11 dB		
	3.6 GHz to 4.2 GHz	0.10 dB		
	4.2 GHz to 4.4 GHz	0.11 dB		
	4.4 GHz to 4.5 GHz	0.14 dB		
	4.5 GHz to 4.6 GHz	0.15 dB		
	4.6 GHz to 4.8 GHz	0.14 dB		
	4.8 GHz to 5.2 GHz	0.13 dB		
	5.2 GHz to 5.4 GHz	0.14 dB		
	5.4 GHz to 5.5 GHz	0.13 dB		
	5.5 GHz to 5.8 GHz	0.12 dB		
	5.8 GHz to 6 GHz	0.11 dB		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Bandwidth at -3dB point	*9 kHz to 18 GHz* -3 dB from set point	0.34 MHz	Filter shape using 438A Power Meter & 8481A Sensor	Lab 1
AMPLITUDE MODULATION				Lab 1
System 1			Using 8902A measuring receiver	
	Modulation rate 50 Hz to 10 kHz 5 % AM to 40 % AM	2.0 % of reading + 0.010 % AM	f_c 10 MHz to 1.3 GHz	
	40 % AM to 99 % AM	2.0 % of reading + 0.10 % AM	f_c 10 MHz to 1.3 GHz	
System 2			Using N5531S measuring receiver system	
	5 % AM to 99 % AM *Modulation rate 50 Hz to 10 kHz*	0.75 % of reading	f_c 100 kHz to 10 MHz	
	20 % AM to 99 % AM *Modulation rate 50 Hz to 100 kHz*	0.50 % of reading	f_c 10 MHz to 3 GHz	
	5 % AM to 20 % AM *Modulation rate 50 Hz to 100 kHz*	2.5 % of reading	f_c 10 MHz to 3 GHz	
	20 % AM to 99 % AM *Modulation rate 50 Hz to 100 kHz*	1.5 % of reading	f_c 3 GHz to 18 GHz	
	5 % AM to 20 % AM *Modulation rate 50 Hz to 100 kHz*	4.5 % of reading	f_c 3 GHz to 18 GHz	
FREQUENCY MODULATION System 1			f_c 10 MHz to 1.3 GHz, using 8902A measuring receiver. Not all combinations of carrier deviation and modulation frequencies may be realisable.	Lab 1
	0 kHz to 4 kHz *Modulation rate 20 Hz to 50 Hz*	2.0 % + 1.0 Hz		
	Modulation rate 50 Hz to 100 kHz	1.0 % + 1.0 Hz		
	Modulation rate 100 kHz to 200 kHz	5.0 % + 1.0 Hz		
	4 kHz to 40 kHz *Modulation rate 20 Hz to 50 Hz*	2.0 % + 10 Hz		
	Modulation rate 50 Hz to 100 kHz	1.0 % + 10 Hz		
	Modulation rate 100 kHz to 200 kHz	5.0 % + 10 Hz		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
FREQUENCY MODULATION System 1 (continued)	40 kHz to 400 kHz *Modulation rate 50 Hz to 100 kHz* *Modulation rate 20 Hz to 50 Hz and 100 kHz to 200 kHz*	 1.0 % + 100 Hz 5.0 % + 100 Hz		Lab 1
System 2	200 Hz to 400 kHz *Modulation rate 20 Hz to 200 kHz*	1.0 % of reading	Using N5531S measuring receiver system. Not all combinations of carrier deviation and modulation frequencies may be realisable.	
SPECTRUM ANALYSIS	+30 dBm to -100 dBm *3 Hz to 3 GHz* *3 GHz to 6.6 GHz* *6.6 GHz to 13.2 GHz* *13.2 GHz to 22 GHz*	 0.25 dB 0.75 dB 1.2 dB 1.1 dB	Using N5531S measuring receiver system.	Lab 1
DISTORTION FACTOR	0 dB to -80 dB	1.0 dB	Includes in-band noise and spurs. All spectral components must lie within the range 20 Hz to 250 kHz.	Lab 1
DIMENSIONAL MEASUREMENTS			All linear calibrations may be given in inch units.	Lab 2
MEASURING INSTRUMENTS AND MACHINES				
Micrometers				
External	BS 870:2008 0 mm to 600 mm	Heads 2.0 µm between any two points. Zero set 1.0 + (8.0 x length in m) µm		
Internal	BS 959:2008 and above 0 mm to 1000 mm	Heads 2.0 µm between any two points. Extension rods 1.0 + (8.0 x length in m) µm		
Depth	BS 6468:2008 0 mm to 300 mm	Heads 2.0 µm between any two points. Extension rods 1.0 + (8.0 x length in m) µm		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Micrometer heads	As BS 1734:1951 0 to 100	1.6 µm		Lab 2
Micrometer setting rods/ Length gauges, flat & spherical ended	BS 870:2008 25 mm to 600 mm	1.0 + (5.0 x length in m) µm		
Three point bore	2 mm to 178 mm	Overall performance 4.0 µm	Using ring gauges of a known size	
Vernier Gauges				
Caliper	BS 887:2008 and above 0 mm to 1500 mm	Overall performance 10 + (30 x length in m) µm		
Depth	As BS 6365: 2008 0 to 600			
Dial gauges and dial test indicators	As BS 907:2008 and BS 2795:1981 0 mm to 25 mm	2.0 µm		
External and Internal Dial Callipers	0-150mm	3.5 µm	In house procedure PRO580	
Simple height gauges	BS EN ISO 13225:2012 0 mm to 300mm 300 mm to 450mm 450 mm to 600mm 600 mm to 1000mm	Length measurement error (E) 5 µm 6 µm 7 µm 8 µm		
Spirit levels	As BS 958:1968 5 seconds to 60 minutes of arc nominal sensitivity	1.5 seconds of arc		
ACCELEROMETRY				Lab 2
Portable Accelerometer (brake meters)	Horizontal acceleration 0 % to 100 %	1.0 % of horizontal acceleration	NOTE Mechanical brake meters only Horizontal acceleration expressed as a percentage (%) of the local free fall acceleration due to gravity. Brake meters calibrated using an incliable test rig.	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
LENGTH			All linear calibrations may be given in inch units.	Lab 2
Plain plug gauges (parallel) Cylindrical setting standards	1 mm to 50 mm diameter 50 mm to 150 mm diameter	1.0 µm 1.5 µm	By comparison with reference standards	
Precision pins	0.05 mm to 10 mm diameter	1.0 µm		
Plain ring gauges (parallel) and setting standards	3 mm to 50 mm diameter 50 mm to 100 mm 100 mm to 150 mm diameter 150 mm to 200 mm diameter	1.7 µm 1.8 µm 2.2 µm 2.3 µm	By comparison with reference standards	
Thread measuring cylinders	As BS3777:1964 and BS5590:1978 and specials 0.1 to 5.0 diameter	0.80 µm		
Plain gap gauges (parallel)	1 to 100mm	3.0 µm	Using gauge blocks	
Gauge blocks		Class (see note)		
Inch (Steel)	As BS 4311-1:2007 0.01 inch to 0.4 inch 0.4 inch to 1 inch 2 inch 3 inch 4 inch	C 3.4 µ inches 4.1 µ inches 5.7 µ inches 7.6 µ inches 9.6 µ inches	Note: **Class C** uncertainties apply to the measurement of length of steel gauges by comparison with grade K standards of length of a similar material. Class C uncertainties apply to new and used grade 0, 1 & 2 gauges to BS 4311-1:2007 and BS EN ISO 3650:1999	
Millimetre (Steel)	As BS EN ISO 3650:1999 0.25 mm to 10 mm 10 mm to 25 mm 30 mm, 40 mm, 50 mm 60 mm, 70 mm, 75 mm 80 mm, 90 mm, 100 mm	C 0.10 µm 0.11 µm 0.13 µm 0.17 µm 0.20 µm		
Feeler Gauges	As BS 957:2008 0.02 mm to 1.00 mm	1.5 µm		
Paint thickness setting foils	0.01 mm to 8 mm	2.0 µm	By comparison with reference standards and a single axis measuring machine.	
Parallels	As BS 906:1972 5 to 50 x 100 x 400	2.0 µm to 5.0 µm		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Squares Blade type	50 mm to 450 mm	5.5 µm	The uncertainty quoted is for the departure from flatness, i.e. the distance separating the two parallel planes which just enclose the surface under consideration.	
Right angle and box angle plates	As BS 5535:1978 50 mm to 300 mm	Squareness: 3.0 + (1.0 per 100 mm) Parallelism: 0.0030 mm		
Vee blocks	As BS 3731:1987 20 mm to 100 mm	5.0 µm		
FORM				Lab 2 and Site
Surface plates and tables Granite Cast iron	BS 817:2008 160 mm x 100 mm to 2500 mm x 1600 mm	1.5 µm + (0.80 x diagonal in m) µm See Note 1	The uncertainty quoted is for the departure from flatness, i.e. the distance separating the two parallel planes which just enclose the surface under consideration.	
ANCILLARY MEASUREMENTS				
Flatness		0.2	Ancillary measurements made for completeness of calibration. Best CMC's are dependent on methodology and range.	
Parallelism		0.8		
Squareness		2.5		
Straightness		1.4 + (0.8 x length in m)		
MASS See notes 1 and 2	Nominal Value (g) 50 000 20 000 10 000 5 000 2 000 1 000 500 200 100 50 20 10 5 2 1 0.5 0.2 0.1 0.05 0.02 0.01 0.005 to 0.001	(mg) 50 20 10 5.0 2.0 1.0 0.50 0.20 0.10 0.060 0.050 0.040 0.030 0.024 0.020 0.016 0.012 0.010 0.0080 0.0060 0.0050 0.0040	Note 1: Calibrations can be given in other units as required. Note 2: Intermediate values can be calibrated to an uncertainty interpolated from the next higher and lower values in the table. Note 3: The calibration is based on Borda's method of substitution	Lab 2

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
TORQUE			Note 1: Values may be given in other units, i.e. lbf/ft, mV/V etc.	Lab 2
Torque Wrenches and screwdrivers	BS EN 6789-2:2017 (See note 2) 0.1 to 1040 N·m	1.0 %	Note 2: Excluding setting screwdrivers below 1 N·m at lowest level	
	BS EN 6789:2003 (withdrawn) 0.1 to 2500 N·m	1.6 %		
Static Torque Transducers	0.005 to 1500 N·m Classes 0.05 to 5.0 See Note 1	0.040 % of reading	Calibrated to BS 7882:2017	
TEMPERATURE				Lab 2
Temperature block calibrators	-50 °C to +100 °C 100 °C to 250 °C 250 °C to 650 °C	0.060 °C 0.060 °C to 0.13 °C 0.13 °C		
Resistance thermometers	-40 °C to 0 °C 0 °C Ambent temperature (20 °C) 0 °C to 250 °C 250 °C to 270 °C 270 °C to 650 °C	0.040 °C 0.025 °C 0.025 °C 0.040 °C 0.090 °C 0.35 °C	Comparison in liquid bath, ice bath or block calibrator	
Thermocouples	-40 °C to +50 °C 50 °C to 250 °C 250 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1200 °C	0.10 °C 0.10 °C to 0.20 °C 0.35 °C to 0.60 °C 1.7 °C to 2.5 °C 2.5 °C to 3.5 °C	Comparison in liquid bath, ice bath or block calibrator	
Thermocouples, batch calibration	-40 °C to +250 °C	0.080 °C	Comparison in liquid bath or ice bath	
Compensating and extension cables for Base metal thermocouples Noble metal thermocouples	 0 °C and 20 °C to 40 °C 0 °C and 20 °C to 40 °C	 0.055 °C 0.12 °C	Comparison in liquid bath or ice bath	
Digital thermometers with probes	-40 °C to 0 °C 0 °C Ambient temperature (20 °C) 0 °C to 250 °C 250 °C to 270 °C 270 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1200 °C	0.040 °C 0.025 °C 0.025 °C 0.040 °C 0.065 °C 0.25 °C 1.7 °C to 2.5 °C 2.5 °C to 3.5 °C	Comparison in liquid bath, ice bath or block calibrator	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
TEMPERATURE (continued)				
Liquid in glass thermometers	-40 °C to +70 °C 70 °C to 270 °C	0.050 °C 0.050 °C to 0.20 °C	Comparison in liquid bath, ice bath or block calibrator. Thermometers can be read with an uncertainty of 1/5 of the smallest marked division	
Liquid baths	-50 °C to +300 °C	0.040 °C	Using PRTs. Suitable for characterisation of temperature calibration baths	
Temperature controlled environmental chambers, fridges/refrigerators, freezers, ovens, incubators and rooms	-40 °C to +250 °C	1.0 °C	Single and multipoint time dependent temperature profiling, also referred to as spatial temperature surveying or mapping.	Site
Digital thermometers with probes	-20 °C to +140 °C	0.20°C		
Digital thermometers with probes and indicators including data loggers	10 °C to 25 °C 25°C to 37 °C 37 °C to 50 °C	0.18 °C to 0.14 °C 0.14 °C to 0.15°C 0.15 °C to 0.27 °C	Performed in air	Lab 2
RELATIVE HUMIDITY				
Relative humidity instruments with displays including data loggers	Performed at 25 °C 20 %rh to 80 %rh	 1.70 %rh	By comparison with a reference hygrometer	Lab 2
ELECTRICAL SIMULATION				Lab 2
Electrical calibration of temperature indicators and simulators			Uncertainties based on Types J, K. R and B. Uncertainties may be higher for other thermocouple types	
Base metal thermocouples	-200 ºC to -100 °C -100 ºC to -30 °C -30 ºC to +1200 °C 1200 °C to 1370 °C	0.18 °C 0.090 °C 0.080 °C 0.11 °C	Including cold junction compensation	
Noble metal thermocouples	-50 ºC to +50 °C 50 ºC to 270 °C 270 °C to 1820 °C	0.70 °C 0.50 °C 0.40 °C	Including cold junction compensation	
Cold junction compensation	Ambient temperature	0.080 °C		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
PRESSURE			Methods consistent with EURAMET CG17	Lab 2
Gas pressure (absolute)				
Calibration of pressure measuring instruments and gauges	3.5 kPa to 175 kPa 175 kPa to 700 kPa 700 kPa to 7 MPa 7 MPa to 17 MPa	0.0094 % + 2.0 Pa 0.010 % + 0.020 Pa 0.010 % + 0.20 Pa 0.028 % + 73 Pa		
Gas pressure (gauge)				
Calibration of pressure measuring instruments and gauges	-100 kPa to 0 kPa 0 kPa to 3.5 kPa 3.5 kPa to 175 kPa 175 kPa to 700 kPa 700 kPa to 7 MPa 7 MPa to 17 MPa	97 Pa 2.0 Pa 0.0090 % + 0.020 Pa 0.0096 % + 0.020 Pa 0.0096 % + 0.20 Pa 0.028 %		
Hydraulic pressure (gauge)				Lab 2
Calibration of pressure measuring instruments and gauges	350 kPa to 0.69 MPa 0.70 MPa to 7.1 MPa 7.1 MPa to 83.5 MPa 83.5 MPa to 140 MPa	0.0082 % + 0.13 kPa 0.0094 % + 0.11 kPa 0.0090 % + 0.11 kPa 0.080 % + 10 kPa		
Hydraulic pressure (gauge)				Site
Calibration of pressure measuring instruments and gauges	0 MPa to 7 MPa 7 MPa to 35 MPa 35 MPa to 70 MPa 70 MPa to 140 MPa	0.080 % + 0.10 kPa 0.090 % + 1.0 kPa 0.20 % + 7.0 kPa 0.080 % + 10 kPa		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
NON AUTOMATIC WEIGHING INSTRUMENTS (NAWI)	Capacity		Note 1: Weights are available in	Site
Electronic and mechanical self-indicating non automatic weighing instruments and spring balances See notes 1 and 2	200 mg 500 mg 1 g 2 g 5 g 10 g 12 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 50 kg 100 kg 200 kg 500 kg 1000 kg 2000 kg 3500 kg	0.012 mg 0.015 mg 0.018 mg 0.025 mg 0.037 mg 0.042 mg 0.058 mg 0.092 mg 0.16 mg 0.30 mg 0.78 mg 3.3 mg 6.5 mg 16 mg 33 mg 65 mg 160 mg 3.5 g 7.0 g 18 35 g 70 g 110 g	OIML Class E2 Max grouped load 800 g OIML Class F1 Max grouped load 95 kg OIML Class M1 Max grouped load 3500 kg Note 2: Other loads within the overall listed range may also be used. Note 3: The calibration procedure PRO17 is based on EURAMET CG-18	
FORCE				Lab 2
Calibration of force measuring devices (e.g. strain gauged load cells and load measuring rings) but excluding proving devices, in tension and compression modes using masses and reference devices	From 0.1 N up to 2500 N From 0.6 kN up to 600 kN	0.10 % 0.23 %	Calibration performed to BS 8422:2003	
Calibration of push pull force measuring devices in tension and compression using masses and reference devices	0.001 N to 2 kN	0.10 %		

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