Schedule of Accreditation

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Instrument Repairs and Calibration
A trading company of IRC Limited

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Calibration performed by the Organisation at the locations specified

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Unit 5 Howard Court Industrial Estate East Kilbride Glasgow G74 4QZ	**Local contact** Contact: Mr Craig Moore Tel: +44 (0)1355 264120 E-Mail: service@instrument-repairs.com Website: www.instrument-repairs.com	Head Office Permanent Laboratory Electrical Dimensional	East Kilbride
Address IRC Ltd 7A Ferguson Centre 53-57 Manse Road Glengormley Newtonabbey BT36 6RW United Kingdom	**Local contact** Contact: Mr Frank Silo Tel: +44 (0)2890 837300 E-Mail: Belfast@instrument-repairs.com Website: www.instrument-repairs.com	Permanent Laboratory Electrical	Belfast and site calibration

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.	**Local contact** Contact: Mr Craig Moore Tel: +44 (0)1355 264120 Contact: Mr Frank Silo Tel: +44 (0)2890 837300	Site Dimensional Site Electrical	East Kilbride and site calibration Belfast and site calibration

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL			Method used: All electrical calibrations are performed as a direct comparison against a reference standard unless otherwise stated.	East Kilbride
DC Voltage				
Measurement	0 V to 100 mV	12 µV/V + 0.50 µV	For measurement of instrument outputs	
	100 mV to 1 V	10 µV/V + 1.1 µV		
	1 V to 10 V	11 µV/V + 10 µV		
	10 V to 100 V	12 µV/V + 110 µV		
	100 V to 1000 V	12 µV/V + 1.1 mV		
	1 kV to 40 kV	0.24 %		
	40 kV to 60 kV	0.66 kV		
Generation	0 mV to 30 mV	70 µV/V + 3.6 µV	Values can be generated for the calibration of measuring instruments	
	30 to 300 mV	70 µV/V + 4.6 µV		
	300 mV to 3 V	58 µV/V + 16 µV		
	3 V to 30 V	58 µV/V + 190 µV		
	30 V to 300 V	64 µV/V + 2.5 mV		
	300 V to 1000 V	64 µV/V + 8.3 V		
	1 kV to 40 kV	0.24 %		
	40 kV to 60 kV	0.66 kV		
DC Current				
Measurement	0 µA to 1 µA	63 µA/A + 54 pA	For measurement of instrument outputs	
	1 µA to 10 µA	25 µA/A + 71 pA		
	10 µA to 100 µA	25 µA/A + 0.42 nA		
	100 µA to 1 mA	25 µA/A + 7.0 nA		
	1 mA to 10 mA	25 µA/A + 70 nA		
	10 mA to 100 mA	42 µA/A + 0.70 µA		
	100 mA to 1 A	130 µA/A + 19 µA		
	1 A to 10 A	0.10 %		
	10 A to 60 A	0.20 %		
	60 A to 300A	0.61%		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (continued)			Method used: All electrical calibrations are performed as a direct comparison against a reference standard unless otherwise stated.	East Kilbride
DC Current (continued)				
Generation	0 µA to 3 mA	150 µA/A + 95 nA	Values can be generated for the calibration of measuring instruments	
	3 mA to 30 mA	120 µA/A + 0.82 µA		
	30 mA to 300 mA	120 µA/A + 8.5 µA		
	300 mA to 2 A	350 µA/A + 110 µA		
	2 A to 10 A	700 µA/A + 0.90 mA		
	10 A to 60 A	0.20 %		
	60 A to 300A	0.86 %		
	60 A to 550 A	0.50 %	Appropriate for the calibration of clamp-on ammeters	
	550 A to 1025 A	1.0 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (continued)			Method used: All electrical calibrations are performed as a direct comparison against a reference standard unless otherwise stated.	East Kilbride
DC Resistance				
Measurement	0 Ω to 10 Ω	19 μΩ/Ω + 58 μΩ	For measurement of instrument outputs	
	10 Ω to 100 Ω	15 μΩ/Ω + 0.60 mΩ		
	100 Ω to 1 kΩ	13 μΩ/Ω + 0.60 mΩ		
	1 kΩ to 10 kΩ	16 μΩ/Ω + 6.0 mΩ		
	10 kΩ to 100 kΩ	13 μΩ/Ω + 58 mΩ		
	100 kΩ to 1 MΩ	20 μΩ/Ω +3.0 Ω		
	1 MΩ to 10 MΩ	61 μΩ/Ω + 120 Ω		
	10 MΩ to 100 MΩ	700 μΩ/Ω + 1.2 kΩ		
	100 MΩ to 1 GΩ	0.65 % + 12 kΩ		
Generation	100 μΩ	170 nΩ	Values can be sourced / generated for the calibration of measuring instruments	
Specific Values	1 mΩ	0.21 μΩ		
	10 mΩ	4.0 μΩ		
	100 mΩ	92 μΩ		
	0.25 Ω	7.3 mΩ		
	0.3 Ω	12 mΩ		
	0.4 Ω	26 mΩ		
	0.5 Ω	5.0 mΩ		
	0.6 Ω	15 mΩ		
	0.7 Ω	9.0 mΩ		
	0.8 Ω	8.0 mΩ		
	0.9 Ω	16 mΩ		
	1 Ω	72 μΩ		
	2 Ω	3.0 mΩ		
	4 Ω	3.0 mΩ		
	6 Ω	3.0 mΩ		
	8 Ω	3.0 mΩ		
	10 Ω	660 μΩ		
	100 Ω	7.0 mΩ		
	1 kΩ	120 mΩ		
	10 kΩ	1.2 Ω		
	100 kΩ	12 Ω		
	1 MΩ	1.0 kΩ		
	10 MΩ	0.034 %		
	100 MΩ	0.16 %		
	1 GΩ	0.13 %		
	10 GΩ	0.31 %		
	100 GΩ	1.7 %		
	1 TΩ	1.3 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL (continued)			Method used: All electrical calibrations are performed as a direct comparison against a reference standard unless otherwise stated.	East Kilbride
DC Resistance (continued)				
Generation (continued)				
Other values	0 Ω to 10 Ω	140 µΩ/Ω + 9.5 mΩ	The CMCs shown are for 4-terminal measurements. The quoted uncertainty may be increased for 2-terminal measurements	
	10 Ω to 30 Ω	140 µΩ/Ω + 18 mΩ		
	30 Ω to 100 Ω	100 µΩΩ + 18 mΩ		
	100 Ω to 300 Ω	100 µΩ/Ω + 18 mΩ		
	300 Ω to 1 kΩ	100 µΩ/Ω + 71 mΩ		
	1 kΩ to 3 kΩ	100 µΩ/Ω + 75 mΩ		
	3 kΩ to 10 kΩ	100 µΩ/Ω + 0.70 Ω		
	10 kΩ to 30 kΩ	100 µΩ/Ω + 0.75 Ω		
	30 kΩ to 100 kΩ	130 µΩ/Ω + 7.0 Ω		
	100 kΩ to 300 kΩ	140 µΩ/Ω + 8.5 Ω	2-terminal measurements	
	300 kΩ to 1 MΩ	170 µΩ/Ω + 67 Ω		
	1 MΩ to 3 MΩ	170 µΩ/Ω + 99 Ω		
	3 MΩ to 10 MΩ	690 µΩ/Ω + 700 Ω		
	10 MΩ to 30 MΩ	0.12 % + 1.7 kΩ		
	30 MΩ to 100 MΩ	0.58 % + 16 kΩ		
	100 MΩ to 300 MΩ	0.58 % + 120 kΩ		
AC Voltage	*40 Hz to 1 kHz*		For measurement of instrument outputs	
Measurement	1 mV to 10 mV	240 µV/V + 1.5 µV		
	10 mV to 100 mV	82 µV/V + 5.2 µV		
	100 mV to 1 V	80 µV/V + 46 µV		
	1 V to 10 V	81 µV/V + 2.4 mV		
	10 V to 100 V	230 µV/V + 5.3 mV		
	100 V to 700 V	500 µV/V + 30 mV		
	700 V to 1000 V	0.13 % + 120 mV		
	1 kHz to 100 kHz			
	100 mV to 1 V	930 µV/V + 43 µV		
	1 V to 10 V	930 µV/V + 0.40 mV		
	10 V to 100 V	0.14 % + 5.0 mV		
	1 kHz to 20 kHz			
	100 V to 700 V	700 µV/V + 30 mV		
	50 Hz			
	1 kV to 28 kV	0.50 %		
	28 kV to 50 kV	0.69 kV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Voltage (continued)				
Generation	*10 Hz to 45 Hz*		Values can be generated for the calibration of measuring instruments	
	1 mV to 30 mV	0.40 % + 23 µV		
	30 mV to 300 mV	0.29 % + 59 µV		
	300 mV to 3 V	0.17 % + 420 µV		
	3 V to 30 V	0.18 % + 3.2 mV		
	45 Hz to 1 kHz			
	300 V to 1000 V	0.060 % + 98 mV		
	1 kHz to 5 kHz			
	300 V to 1000 V	0.23 % + 32 mV		
	5 kHz to 10 kHz			
	300 V to 1000 V	0.23 % + 32 mV		
	45 Hz to 10 kHz			
	1 mV to 30 mV	0.18 % + 23 µV		
	30 mV to 300 mV	0.060 % + 25 µV		
	300 mV to 3 V	0.040 % + 110 µV		
	3 V to 30 V	0.050 % + 1.1 mV		
	30 V to 300 V	0.10 % + 3.2 mV		
	10 kHz to 20 kHz			
	30 V to 300 V	0.10 % + 3.2 mV		
	10 kHz to 100 kHz			
	1 mV to 30 mV	0.40 % + 39 µV		
	10 kHz to 50 kHz			
	30 mV to 300 mV	0.19 % + 47 µV		
	300 mV to 3 V	0.16 % + 360 µV		
	3 V to 30 V	0.22 % + 5.9 mV		
	50 kHz to 100 kHz			
	30 mV to 300 mV	0.28 % + 200 µV		
	300 mV to 3 V	0.28 % + 2.0 mV		
	3 V to 30 V	0.28 % + 20 mV		
	100 kHz to 500 kHz			
	1 mV to 30 mV	1.2 % + 70 µV		
	30 mV to 300 mV	0.81 % + 380 µV		
	300 mV to 3 V	0.63 % + 3.9 mV		
	50 Hz			
	1 kV to 28 kV	0.50 %		
	28 kV to 50 kV	0.69 kV		East Kilbride

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Current				East Kilbride
Measurement	*45 Hz to 1 kHz*		For measurement of instrument outputs	
	5 μA to 100 μA	700 μA/A + 48 nA		
	100 μA to 1 mA	700 μA/A + 400 nA		
	1 mA to 10 mA	700 μA/A + 2.6 μA		
	10 mA to 100 mA	400 μA/A + 26 μA		
	100 mA to 1 A	0.12 % + 280 μA		
	1 kHz to 5 kHz			
	1 mA to 10 mA	700 μA/A + 2.6 μA		
	10 mA to 100 mA	400 μA/A + 26 μA		
	100 mA to 1 A	0.12 % + 24 mA		
	50 Hz			
	1 A to 10 A	0.13 %		
	10 A to 100 A	1.1 %		
Generation	*10 Hz to 5 kHz*		Values can be generated for the calibration of measuring instruments	
	29 μA to 100 μA	0.47 % + 200 nA		
	100 μA to 1 mA	0.23 % + 380 nA		
	1 mA to 10 mA	0.23 % + 3.8 μA		
	10 mA to 100 mA	0.24 % + 38 μA		
	5 kHz to 10 kHz			
	29 μA to 100 μA	1.5 % + 210 nA		
	100 μA to 1 mA	0.70 % + 450 nA		
	1 mA to 10 mA	0.70 % + 5.8 μA		
	10mA to 100 mA	0.70 % + 58 μA		
	10 Hz to 1 kHz			
	100 mA to 1 A	0.12 % + 390 μA		
	1 k Hz to 5 kHz			
	100 mA to 1 A	0.87 % + 420 μA		
	45 Hz to 1 kHz			
	1 A to 11 A	0.39 % + 4.7 mA		
	50 Hz			
	10 A to 100 A	1.1 %		
	45 Hz to 1 kHz			
	11 A to 16.5 A	1.5 %	For the calibration of clamp-on ammeters	
	16.5 A to 550 A	0.50 %		
	550 A to 1025 A	1.1 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Power	*45 Hz to 400 Hz* 1 W to 11 kW	 0.45 %	 At unity power factor only	East Kilbride
AC phase angle	*50 Hz* 0° to 360°	 0.28°	 Voltage : Current Phase	
Tachometer calibration	600 rpm to 50000 rpm	0.60 rpm		
Inductance				
Generation	*At 1 kHz:* 100 µH 1 mH 10 mH 100 mH 1 H 10 H	 2.6 µH 26 µH 380 µH 2.2 mH 22 mH 98 mH	Values can be generated for the calibration of measuring instruments	
Capacitance				
Generation	*At 5 kHz:* 400 pF *At 1 kHz:* 1 nF 2 nF 3 nF 10 nF 20 nF 30 nF 100 nF 200 nF 300 nF 1 µF *At 100 Hz:* 2 µF 3 µF 10 µF 20 µF 30 µF *At 50 Hz:* 100 µF 200 µF 300 µF	 13 pF 17 pF 23 pF 29 pF 70 pF 180 pF 210 pF 420 pF 960 pF 1.3 nF 4.2 nF 11 nF 15 nF 53 nF 130 nF 180 nF 0.72 µF 2.0 µF 3.8 µF	Values can be generated for the calibration of measuring instruments	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
EQUIPMENT FOR IEE 17TH EDITION WIRING TESTING			Other, similar, equipment that includes the same quantities and ranges can also be calibrated.	East Kilbride
<u>RCD Testers</u>				
Trip Time	20 ms to 390 ms 390 ms to 900 ms	0.90 ms 8.2 ms		
Trip Current	*At 50 Hz:* 10 mA 30 mA 100 mA 300 mA 1 A 2 A	 34 µA 0.26 mA 0.17 mA 2.0 mA 3.3 mA 10 mA	For trip times < 200 ms	
	At 50 Hz: 10 mA 30 mA 100 mA 300 mA 1 A 2 A	 34 µA 0.28 mA 0.17 mA 2.0 mA 3.3 mA 10 mA	For trip times > 200 ms	
<u>Loop Testers</u>				
AC Resistance	*At 50 Hz:* 0.05 Ω 0.1 Ω 0.22 Ω 0.33 Ω 0.5 Ω 1 Ω 5 Ω 10 Ω 100 Ω 1 kΩ	 2.9 mΩ 1.5 mΩ 1.3 mΩ 3.5 mΩ 3.1 mΩ 4.0 mΩ 9.2 mΩ 25 mΩ 100 mΩ 140 mΩ		
<u>Continuity Testers</u>				
DC Resistance	See *Specific Values* on Page 3.			
DC Continuity Current	10 mA to 100 mA 100 mA to 200 mA 200 mA to 300 mA	0.98 mA 0.65 mA 1.5 mA		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
<u>Insulation Testers</u>				East Kilbride
DC Resistance	See *Specific Values* on Page 4.			
DC Voltage	50 V 100 V 250 V 500 V 1000 V 1000 V to 10 kV	1.0 V 1.0 V 1.0 V 1.4 V 1.6 V See *DC Voltage* measurement capability on Page 2.		
<u>Portable Appliance Testers</u>				
Earth bond resistance	*At 50 Hz:* 40 mΩ 100 mΩ 200 mΩ 500 mΩ 1 Ω 5 Ω 10 Ω	 2.6 mΩ 1.3 mΩ 2.0 mΩ 2.2 mΩ 1.8 m Ω 7.5 mΩ 35 mΩ		
Earth bond current	*At 50 Hz:* 0 mA to 100 mA 100 mA to 300 mA 1 A to 30 A	 4.7 mA 9.0 mA 420 mA		
Leakage current	*At 50 Hz:* 2 mA 4.7 mA 7.7 mA	 15 µA 25 µA 59 µA		
Flash test	*At 50 Hz:* 1 kV to 7 kV	 See *AC Voltage* measurement capability on Page 4.		
Load test	*At 50 Hz:* 3 kVA	 2.0 %		
OSCILLOSCOPE CALIBRATION				
Vertical coefficients Horizontal coefficients	5 mV to 50 V p-p 2 ns to 1 µs 1 µs to 5 s	0.47 % 29 µs/s 32 µs/s		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL SIMULATION OF TEMPERATURE				East Kilbride
Calibration of thermocouple indicators			Including cold junction compensation	
Thermocouple type				
Type B	600 °C to 800 °C 800 °C to 1820 °C	1.1 °C 1.1 °C		
Type C	0 °C to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.55 °C 0.58 °C 0.67 °C 0.76 °C 1.2 °C		
Type E	-250 °C to -100 °C -100 °C to +650 °C 650 °C to 1000 °C	0.59 °C 0.24 °C 0.29 °C		
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to +150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.36 °C 0.24 °C 0.22 °C 0.25 °C 0.32 °C		
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to +120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.41 °C 0.26 °C 0.24 °C 0.34 °C 0.49 °C		
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to +410 °C 410 °C to 1300 °C	0.53 °C 0.35 °C 0.32 °C 0.39 °C		
Type R	0 °C to 250 °C 250 °C to 1767 °C	1.2 °C 1.1 °C		
Type S	0 °C to 250 °C 250 °C to 1767 °C	1.2 °C 1.1 °C		
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.73 °C 0.31 °C 0.24 °C 0.22 °C		
Calibration of RTD indicators	-200 °C to +800 °C	0.0031 °C		
Temperature of reference junction / Cold junction compensation	At ambient temperature of 20 °C ± 3 °C, or nominal 0°C	0.030 °C		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
DIMENSIONAL CALIBRATION LENGTH				East Kilbride
Plain plug gauges (parallel)	1 to 50 diameter 50 to 100 diameter 100 to 200 diameter 200 to 300 diameter	1.0 1.1 on diameter 1.6 1.8	Using a length measuring machine.	
Length gauges, flat and spherical ended	25 to 1000	1 + (7.0 x length in m)	Using a length measuring machine or by comparison with end standards.	
Feeler gauges	BS 957:2008 0.025 to 1	1.0		
MEASURING INSTRUMENTS AND MACHINES			Instrument entries in this section of the schedule also cover digital and dial type gauges which are calibrated based on the quoted standards.	
External micrometer	BS 870:2008 and above 0 to 1000 Heads: (Zero) Setting, 0 to 25: (Zero) Setting, 25 to 1000: Flatness of anvils: Parallelism of anvils: Spindle alignment:	 2.0 between any two points 1.0 1.0 + (8.0 x length in m) 0.58 1.0 10		
Internal micrometer	BS 959:2008 5 to 900	Heads 2.0 between any two points. Setting and extension rods 1.0 + (8.0 x length in m)		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Depth micrometer	Based on BS 6468:2008 0 to 300 Heads: Setting and Extension rods: Base Flatness: Rod Flatness: Parallelism: Rod axis of rotation: Squareness of Face to spindle / rod axis: Rod axis to datum face:	 2.0 1.0 + (8.0 x length in m) 0.40 0.58 3.0 10 5.0 10		East Kilbride
Vernier type gauges including dial and digital				
Caliper	BS 887:2008 0 to 1000 Overall performance Flatness Parallelism Squareness Width of internal jaws	 10 + (30 × length in m) 3.5 3.5 5.5 3.5		
Height	BS 1643:2008 0 to 1000 Overall performance	 10 + (30 × length in m)		
Depth	BS 6365:2008 0 to 600 Overall performance	 10 + (30 × length in m)		
Dial gauges and dial test indicators	BS 2795:1981, BS 907:2008 and above. 0 to 25 0 to 50 0 to 75 0 to 100	 1.1 1.3 1.6 1.8		
FORM Surface plates & tables Granite and Cast iron	BS 817:2008 (and above) 160 x 100 to 4000 x 4000 Flatness of working surface (Note 1): Local variation of working surface:	 1.5 + (0.80 x diagonal in m) 2.2	Note 1) The uncertainty quoted is for the departure from flatness, straightness, or squareness, i.e. the distance separating the two parallel planes, which just enclose the surface under consideration.	East Kilbride and site calibration

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL CALIBRATION				Belfast and site calibration
DC Voltage				
Measurement	0 V to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V 1 kV to 40 kV 40 kV to 60 kV	12 µV/V + 0.50 µV 10 µV/V + 1.1 µV 11 µV/V + 10 µV 12 µV/V + 110 µV 12 uV/V + 1.1 mV 0.24 % 0.66 kV		
Generation	0 mV to 30 mV 30 to 300 mV 300 mV to 3 V 3 V to 30 V 30 V to 300 V 300 V to 1000 V 1 kV to 40 kV 40 kV to 60 kV	70 µV/V + 3.6 µV 70 µV/V + 4.6 µV 58 µV/V + 16 µV 58 µV/V + 190 µV 64 µV/V + 2.5 mV 64 µV/V + 8.3 V 0.24 % 0.66 kV		
DC Current				
Measurement	0 µA to 1 µA 1 µA to 10 µA 10 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 60 A 60 A to 300A	63 µA/A + 54 pA 25 µA/A + 71 pA 25 µA/A + 0.42 nA 25 µA/A + 7.0 nA 25 µA/A + 70 nA 42 µA/A + 0.70 µA 130 µA/A + 19 µA 0.20 % 0.61%		
Generation	0 µA to 3 mA 3 mA to 30 mA 30 mA to 300 mA 300 mA to 2 A 2 A to 10 A 10 A to 60 A 60 A to 550 A 550 A to 1025 A	150 µA/A + 95 nA 120 µA/A + 0.82 µA 120 µA/A + 8.5 µA 350 µA/V + 110 µA 700 µA/A + 0.90 mA 0.20 % 0.50 % 1.0 %	 Appropriate for the calibration of clamp-on ammeters	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DC Resistance				Belfast and site calibration
Measurement	0 Ω to 10 Ω	19 μΩ/Ω + 58 μΩ		
	10 Ω to 100 Ω	15 μΩ/Ω + 0.60 mΩ		
	100 Ω to 1 kΩ	13 μΩ/Ω + 0.60 mΩ		
	1 kΩ to 10 kΩ	16 μΩ/Ω + 6.0 mΩ		
	10 kΩ to 100 kΩ	13 μΩ/Ω + 58 mΩ		
	100 kΩ to 1 MΩ	20 μΩ/Ω +3.0 Ω		
	1 MΩ to 10 MΩ	61 μΩ/Ω + 120 Ω		
	10 MΩ to 100 MΩ	700 μΩ/Ω + 1.2 kΩ		
	100 MΩ to 1 GΩ	0.65 % + 12 kΩ		
Generation				
Specific Values	100 μΩ	170 nΩ		
	1 mΩ	0.21 μΩ		
	10 mΩ	4.0 μΩ		
	100 mΩ	92 μΩ		
	0.25 Ω	64 mΩ		
	0.3 Ω	33 mΩ		
	0.4 Ω	34 mΩ		
	0.5 Ω	35 mΩ		
	0.6 Ω	36 mΩ		
	0.7 Ω	37 mΩ		
	0.8 Ω	39 mΩ		
	0.9 Ω	40 mΩ		
	1 Ω	75 μΩ		
	2 Ω	52 mΩ		
	4 Ω	75 mΩ		
	6 Ω	99 mΩ		
	8 Ω	120 mΩ		
	10 Ω	670 μΩ		
	100 Ω	7.0 mΩ		
	1 kΩ	120 mΩ		
	10 kΩ	1.2 Ω		
	100 kΩ	12 Ω		
	1 MΩ	1.6 %		
	10 MΩ	0.060 %		
	100 MΩ	0.15 %		
	1 GΩ	0.13 %		
	10 GΩ	0.40 %		
	100 GΩ	2.7 %		
	1 TΩ	1.7 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DC Resistance (continued)				Belfast and site calibration
Generation (continued)				
Other values	0 Ω to 10 Ω	140 µΩ/Ω + 9.5 mΩ	The CMCs shown are for 4-terminal measurements. The quoted uncertainty may be increased for 2-terminal measurements	
	10 Ω to 30 Ω	140 µΩ/Ω + 18 mΩ		
	30 Ω to 100 Ω	100 µΩ/Ω + 18 mΩ		
	100 Ω to 300 Ω	100 µΩ/Ω + 18 mΩ		
	300 Ω to 1 kΩ	100 µΩ/Ω + 71 mΩ		
	1 kΩ to 3 kΩ	100 µΩ/Ω + 75 mΩ		
	3 kΩ to 10 kΩ	100 µΩ/Ω + 0.70 Ω		
	10 kΩ to 30 kΩ	100 µΩ/Ω + 0.75 Ω		
	30 kΩ to 100 kΩ	130 µΩ/Ω + 7.0 Ω		
	100 kΩ to 300 kΩ	140 µΩ/Ω + 8.5 Ω	2-terminal measurements	
	300 kΩ to 1 MΩ	150 µΩ/Ω + 67 Ω		
	1 MΩ to 3 MΩ	150 µΩ/Ω + 99 Ω		
	3 MΩ to 10 MΩ	690 µΩ/Ω + 700 Ω		
	10 MΩ to 30 MΩ	0.12 % + 1.7 kΩ		
	30 MΩ to 100 MΩ	0.58 % + 16 kΩ		
	100 MΩ to 300 MΩ	0.58 % + 120 kΩ		
AC Voltage				
Measurement	*40 Hz to 1 kHz*			
	1 mV to 10 mV	240 µV/V + 1.5 µV		
	10 mV to 100 mV	82 µV/V + 5.2 µV		
	100 mV to 1 V	80 µV/V + 46 µV		
	1 V to 10 V	81 µV/V + 2.4 mV		
	10 V to 100 V	230 µV/V + 5.3 mV		
	100 V to 700 V	500 µV/V + 30 mV		
	700 V to 1000 V	0.13 % + 120 mV		
	1 kHz to 100 kHz			
	100 mV to 1 V	930 µV/V + 43 µV		
	1 V to 10 V	930 µV/V + 0.40 mV		
	10 V to 100 V	0.14 % + 5.0 mV		
	1 kHz to 20 kHz			
	100 V to 700 V	700 µV/V + 30 mV		
	50 Hz			
	1 kV to 28 kV	0.50 %		
	28 kV to 50 kV	0.69 kV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Voltage (continued)				
Generation	*10 Hz to 45 Hz*			
	1 mV to 30 mV	0.40 % + 23 µV		
	30 mV to 300 mV	0.29 % + 59 µV		
	300 mV to 3 V	0.17 % + 420 µV		
	3 V to 30 V	0.18 % + 3.2 mV		
	45 Hz to 1 kHz			
	300 V to 1000 V	0.060 % + 98 mV		
	1 kHz to 5 kHz			
	300 V to 1000 V	0.23 % + 32 mV		
	5 kHz to 10 kHz			
	300 V to 1000 V	0.23 % + 32 mV		
	45 Hz to 10 kHz			
	1 mV to 30 mV	0.18 % + 23 µV		Belfast and site calibration
	30 mV to 300 mV	0.060 % + 25 µV		
	300 mV to 3 V	0.040 % + 110 µV		
	3 V to 30 V	0.050 % + 1.1 mV		
	30 V to 300 V	0.10 % + 3.2 mV		
	10 kHz to 20 kHz			
	30 V to 300 V	0.10 % + 3.2 mV		
	10 kHz to 100 kHz			
	1 mV to 30 mV	0.40 % + 39 µV		
	10 kHz to 50 kHz			
	30 mV to 300 mV	0.19 % + 47 µV		
	300 mV to 3 V	0.16 % + 360 µV		
	3 V to 30 V	0.22 % + 5.9 mV		
	50 kHz to 100 kHz			
	30 mV to 300 mV	0.28 % + 200 µV		
	300 mV to 3 V	0.28 % + 2.0 mV		
	3 V to 30 V	0.28 % + 20 mV		
	100 kHz to 500 kHz			
	1 mV to 30 mV	1.2 % + 70 µV		
	30 mV to 300 mV	0.81 % + 380 µV		
	300 mV to 3 V	0.63 % + 3.9 mV		
	50 Hz			
	1 kV to 28 kV	0.50 %		
	28 kV to 50 kV	0.69 kV		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Current				Belfast and site calibration
Measurement	*45 Hz to 1 kHz*			
	5 μA to 100 μA	700 μA/A + 48 nA		
	100 μA to 1 mA	700 μA/A + 400 nA		
	1 mA to 10 mA	700 μA/A + 2.6 μA		
	10 mA to 100 mA	400 μA/A + 26 μA		
	100 mA to 1 A	0.12 % + 280 μA		
	1 kHz to 5 kHz			
	1 mA to 10 mA	700 μA/A + 2.6 μA		
	10 mA to 100 mA	400 μA/A + 26 μA		
	100 mA to 1 A	0.12 % + 24 mA		
	50 Hz			
	10 A to 100 A	1.1 %		
Generation	*10 Hz to 5 kHz*			
	29 μA to 100 μA	0.47 % + 200 nA		
	100 μA to 1 mA	0.23 % + 380 nA		
	1 mA to 10 mA	0.23 % + 3.8 μA		
	10 mA to 100 mA	0.24 % + 38 μA		
	5 kHz to 10 kHz			
	29 μA to 100 μA	1.5 % + 210 nA		
	100 μA to 1 mA	0.70 % + 450 nA		
	1 mA to 10 mA	0.70 % + 5.8 μA		
	10mA to 100 mA	0.70 % + 58 μA		
	10 Hz to 1 kHz			
	100 mA to 1 A	0.12 % + 390 μA		
	1 k Hz to 5 kHz			
	100 mA to 1 A	0.87 % + 420 μA		
	45 Hz to 1 kHz			
	1 A to 11 A	0.39 % + 4.7 mA		
	50 Hz			
	10 A to 100 A	1.1 %		
	45 Hz to 1 kHz			
	11 A to 16.5 A	1.5 %	For the calibration of clamp-on ammeters	
	16.5 A to 550 A	0.50 %		
	550 A to 1025 A	1.1 %		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Power	*45 Hz to 400 Hz* 1 W to 11 kW	 0.41 %	 At unity power factor only	Belfast and site calibration
AC phase angle	*50 Hz* 0° to 360°	 0.28°	 Voltage : Current Phase	
Tachometer calibration	600 rpm to 50000 rpm	0.60 rpm		
Inductance				
Generation	*At 1 kHz:* 100 µH 1 mH 10 mH 100 mH 1 H 10 H	 2.6 µH 26 µH 380 µH 2.2 mH 22 mH 98 mH		
Capacitance				
Generation	*At 5 kHz:* 400 pF *At 1 kHz:* 1 nF 2 nF 3 nF 10 nF 20 nF 30 nF 100 nF 200 nF 300 nF 1 µF *At 100 Hz:* 2 µF 3 µF 10 µF 20 µF 30 µF *At 50 Hz:* 100 µF 200 µF 300 µF	 13 pF 17 pF 23 pF 29 pF 70 pF 180 pF 210 pF 420 pF 960 pF 1.3 nF 4.2 nF 11 nF 15 nF 53 nF 130 nF 180 nF 0.72 µF 2.0 µF 3.8 µF		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
EQUIPMENT FOR IEE 17TH EDITION WIRING TESTING			Other, similar, equipment that includes the same quantities and ranges can also be calibrated.	Belfast and site calibration
<u>RCD Testers</u>				
Trip Time	20 ms to 390 ms 390 ms to 900 ms	0.90 ms 8.2 ms		
Trip Current	*At 50 Hz:* 10 mA 30 mA 100 mA 300 mA 1 A 2 A	 0.80 mA 2.0 mA 6.0 mA 20 mA 60 mA 120 mA	For trip times < 200 ms	
	At 50 Hz: 10 mA 30 mA 100 mA 300 mA 1 A 2 A	0.80 mA 2.0 mA 6.0 mA 20 mA 60 mA 120 mA 0.80 mA	For trip times > 200 ms	
<u>Loop Testers</u>				
AC Resistance	*At 50 Hz:* 0.05 Ω 0.1 Ω 0.22 Ω 0.33 Ω 0.5 Ω 1 Ω 5 Ω 10 Ω 100 Ω 1 kΩ	 5.0 mΩ 6.0 mΩ 6.0 mΩ 6.7 mΩ 7.7 mΩ 11 mΩ 34 mΩ 63 mΩ 600 mΩ 5.8 Ω		
<u>Continuity Testers</u>				
DC Resistance	See *Specific Values* on Page 13.			
DC Continuity Current	10 mA to 100 mA 100 mA to 200 mA 200 mA to 300 mA	2.2 mA 4.0 mA 5.3 mA		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
<u>Insulation Testers</u>				Belfast and site calibration
DC Resistance	See *Specific Values* on Page 14.			
DC Voltage	50 V 100 V 250 V 500 V 1000 V 1000 V to 10 kV	1.8 V 2.3 V 3.1 V 6.8 V 13 V See *DC Voltage* measurement capability on Page 12.		
<u>Portable Appliance Testers</u>				
Earth bond resistance	*At 50 Hz:* 40 mΩ 100 mΩ 200 mΩ 500 mΩ 1 Ω 5 Ω 10 Ω 100 Ω 1 kΩ	 5.0 mΩ 5.3 mΩ 6.0 mΩ 7.7 mΩ 11 mΩ 34 mΩ 63 mΩ 0.60 Ω 5.8 Ω		
Earth bond current	*At 50 Hz:* 0 mA to 100 mA 100 mA to 300 mA 1 A to 30 A	 4.7 mA 9.0 mA 420 mA		
Leakage current	*At 50 Hz:* 2 mA 4.7 mA 7.7 mA	 15 µA 25 µA 59 µA		
Flash test	*At 50 Hz:* 1 kV to 7 kV	 See *AC Voltage* measurement capability on Page 4.		
Load test	*At 50 Hz:* 3 kVA	 2.0 %		
OSCILLOSCOPE CALIBRATION				
Vertical coefficients Horizontal coefficients	5 mV to 50 V p-p 2 ns to 1 µs 1 µs to 5 s	0.47 % 29 us/s 32 us/s		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ELECTRICAL SIMULATION OF TEMPERATURE				Belfast and site calibration
Calibration of thermocouple indicators			Including cold junction compensation	
Thermocouple type				
Type B	600 °C to 800 °C 800 °C to 1820 °C	1.1 °C 1.1 °C		
Type C	0 °C to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.55 °C 0.58 °C 0.67 °C 0.76 °C 1.2 °C		
Type E	-250 °C to -100 °C -100 °C to +650 °C 650 °C to 1000 °C	0.59 °C 0.24 °C 0.29 °C		
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to +150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.36 °C 0.24 °C 0.22 °C 0.25 °C 0.32 °C		
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to +120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.41 °C 0.26 °C 0.24 °C 0.34 °C 0.49 °C		
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to +410 °C 410 °C to 1300 °C	0.53 °C 0.35 °C 0.32 °C 0.39 °C		
Type R	0 °C to 250 °C 250 °C to 1767 °C	1.2 °C 1.1 °C		
Type S	0 °C to 250 °C 250 °C to 1767 °C	1.2 °C 1.1 °C		
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.73 °C 0.31 °C 0.24 °C 0.22 °C		

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Calibration of RTD indicators Temperature of reference junction / Cold junction compensation	-200 °C to +800 °C At ambient temperature of 20 °C ± 3 °C, or nominal 0°C	0.0031 °C 0.030 °C		Belfast and site calibration
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: $Q[a, b] = [a^2 + b^2]^{1/2}$