


# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

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

 <p><b>UKAS</b> CALIBRATION</p> <p><b>0809</b></p> <p>Accredited to <b>ISO/IEC 17025:2017</b></p>	<h3>Seaward Electronic Ltd</h3> <p><b>Issue No: 025    Issue date: 30 August 2022</b></p>	
	<p><b>Bracken Hill</b> South West Industrial Estate Peterlee Co Durham SR8 2SW United Kingdom</p>	<p><b>Contact: Mr Malcolm Steele</b> Tel: +44 (0) 191 586 3511 Fax: +44 (0) 191 586 0227 E-Mail: <a href="mailto:MalcolmS@seaward.co.uk">MalcolmS@seaward.co.uk</a> Website: <a href="http://www.seaward.co.uk">www.seaward.co.uk</a></p>
<p><b>Calibration performed by the Organisation at the locations specified</b></p>		

### Locations covered by the organisation and their relevant activities

#### Laboratory location:

Location details	Activity	Location code
<p><b>Address</b></p> <p>South West Industrial Estate Peterlee SR8 2SW &amp; SR8 2LS United Kingdom</p> <p><b>Local contact:</b></p> <p>Malcolm Steele Tel: +44 (0) 191 586 3511 Fax: +44 (0) 191 586 0227 E-Mail: <a href="mailto:MalcolmS@seaward.co.uk">MalcolmS@seaward.co.uk</a> Website: <a href="http://www.seaward.co.uk">www.seaward.co.uk</a></p>	<p>Electrical calibration Pressure calibration</p>	<p>Peterlee</p>

#### Site activities performed away from the location listed above:

Location details	Activity	Location code
<p><b>Customers' sites or premises</b></p> <p>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.</p> <p><b>Local contact:</b></p> <p>Malcolm Steele Tel: +44 (0) 191 586 3511 Fax: +44 (0) 191 586 0227 E-Mail: <a href="mailto:MalcolmS@seaward.co.uk">MalcolmS@seaward.co.uk</a> Website: <a href="http://www.seaward.co.uk">www.seaward.co.uk</a></p>	<p>Electrical calibration</p>	<p>Customers' premises</p>



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Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
<b>CALIBRATIONS CONDUCTED AT THE PERMANENT LABORATORY</b>				
<b>ELECTRICAL CALIBRATION</b>			All electrical calibrations are performed as a comparison against a reference standard unless otherwise stated	
DC VOLTAGE				
Generation	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	0.0032 % + 3.6 μV 0.0032 % + 4.8 μV 0.0026 % + 46 μV 0.0032 % + 460 μV 0.0032 % + 4.8 mV	Values can be generated for the calibration of measuring instruments	
Measurement	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	0.00098 % + 1.2 μV 0.00078 % + 1.3 μV 0.00043 % + 3.3 μV 0.00078 % + 50 μV 0.00078 % + 310 μV	For measurement of instrument outputs	
DC RESISTANCE				
Generation	10 Ω 100 Ω  1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ  1 mΩ 10 mΩ 100 mΩ 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ	6.9 mΩ 12 mΩ  93 mΩ 930 mΩ 9.3 Ω 160 Ω 4.6 kΩ 590 kΩ 13 MΩ  0.0015 % 0.00080 % 0.00076 % 0.00069 % 0.00066 % 0.0013 % 0.00077 % 0.0010 % 0.00065 % 0.00079 %	Values can be sourced or generated for the calibration of measuring instruments  Nominal values obtained from a multi-function calibrator for calibration of multimeters, resistance meters etc.  Standard resistors available for calibration of resistance bridges, long-scale multimeters etc.	Peterlee



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
DC RESISTANCE (continued) Measurement	1 mΩ 10 mΩ 100 mΩ 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ  0 Ω to 20 Ω 20 Ω to 200 Ω 200 Ω to 2 kΩ 2 kΩ to 20 kΩ 20 kΩ to 200 kΩ 200 kΩ to 2 MΩ 2 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 2 GΩ	0.0047 % 0.0024 % 0.0010 % 0.00089 % 0.00092 % 0.0012 % 0.00092 % 0.0011 % 0.00091 % 0.00089 %  0.0014 % + 24 μΩ 0.0012 % + 72 μΩ 0.00089 % + 0.69 mΩ 0.00089 % + 7.2 mΩ 0.0012 % + 72 mΩ 0.0023 % + 1.6 Ω 0.0038 % + 92 Ω 0.027 % + 10 kΩ 0.23 % + 1.0 MΩ	For measurement of instrument outputs  Calibration of standard resistors  Calibration of standard resistors, decade resistance boxes etc.	Peterlee
High resistance/high voltage Measurement	1.0 kΩ to 100 kΩ 0.1 MΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ 1 GΩ to 10 GΩ 10 GΩ to 100 GΩ 100 GΩ to 1 TΩ  1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ 1 GΩ to 10 GΩ 10 GΩ to 100 GΩ 100 GΩ to 1 TΩ	0.038 % 0.060 % 0.059 % 0.061 % 0.053 % 0.054 % 0.072 % 0.25 %  0.32 % 0.31 % 0.31 % 0.31 % 0.37 % 0.44 %	For measurement of instrument output / source  The applied voltages will be in the range 10 V to 1000 V DC  The applied voltages will be in the range 1 kV to 50 kV DC	



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
AC VOLTAGE				
Measurement	20 mV to 200 mV 45 Hz to 1 kHz	0.012 % + 17 µV	For measurement of instrument outputs	Peterlee
	200 mV to 2 V 45 Hz to 100 Hz 100 Hz to 2 kHz 2 kHz to 10 kHz	0.011 % + 23 µV 0.0083 % + 23 µV 0.011 % + 23 µV		
	2 V to 20 V 45 Hz to 100 Hz 100 Hz to 2 kHz 2 kHz to 10 kHz	0.011 % + 230 µV 0.0080 % + 230 µV 0.011 % + 230 µV		
	20 V to 200 V 45 Hz to 2 kHz	0.027 % + 2.3 mV		
	200 V to 700 V 45 Hz to 2 kHz	0.056 % + 12 mV		
	700 V to 1000 V 45 Hz to 1 kHz	0.078 % + 12 mV		
Generation	20 mV to 200 mV 45 Hz to 1 kHz 1 kHz to 10 kHz	0.051 % + 25 µV 0.11 % + 41 µV	Values can be generated for the calibration of measuring instruments	
	200 mV to 2 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.051 % + 110 µV 0.11 % + 160 µV		
	2 V to 20 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.045 % + 1.1 mV 0.083 % + 1.6 mV		
	20 V to 200 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.061 % + 11 mV 0.14 % + 47 mV		
	200 V to 700 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.082 % + 100 mV 0.20 % + 490 mV		
	700 V to 1000 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.082 % + 100 mV 0.17 % + 460 mV		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
<b>DC CURRENT</b>				
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 20 A 20 A to 30 A	0.0093 % + 35 nA 0.0083 % + 46 nA 0.0047 % + 350 nA 0.0059 % + 3.5 µA 0.011 % + 41 µA 0.035 % + 410 µA 0.12 % + 410 µA	Values can be generated for the calibration of measuring instruments	
Calibration of clamp-on ammeters using multi-turn coil	30 A to 1500 A	0.54 % + 490 mA	Hall effect clamps	
Measurement	0 µA to 200 µA  200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 1 A 2 A to 20 A	0.0029 % + 2.1 nA  0.0029 % + 8.4 nA 0.0029 % + 84 nA 0.0058 % + 1.4 µA 0.017 % + 25 µA 0.082 % + 12 µA	For measurement of instrument outputs	
<b>AC CURRENT</b>				
Generation	<i>45 Hz to 500 Hz</i> 20 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A  <i>45 Hz to 100 Hz</i> 2 A to 20 A 20 A to 30 A  <i>50 Hz to 60 Hz</i> 30 A to 50 A	 0.12 % + 290 nA 0.11 % + 470 nA 0.11 % + 4.7 µA 0.11 % + 47 µA 0.14 % + 470 µA   0.078 % + 2.3 mA 0.15 % + 2.3 mA  0.10 % + 6.8 mA	Values can be generated for the calibration of measuring instruments	
Calibration of clamp-on ammeters using multi-turn coil	<i>50 Hz to 60 Hz</i> 30 A to 1500 A 30 A to 1500 A	 0.34 % + 0.12 A 0.55 % + 0.50 A	Hall effect clamps Wound clamps	
Measurement	<i>45 Hz to 200 Hz:</i> 2 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A  <i>45 Hz to 100 Hz</i> 2 A to 20 A	 0.023 % + 31 nA 0.023 % + 310 nA 0.023 % + 3.1 µA 0.023 % + 31 µA 0.058 % + 0.50 mA  0.16 % + 0.23 mA	For measurement of instrument outputs	



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FREQUENCY	1 Hz to 1 GHz	2.0 parts in 10 <sup>9</sup>	Can be reported as 1/f for repetitive timing events E.G. RPM	Peterlee
Elapsed time	1 s to 12 hrs	69 ms	Manual start stop. For the calibration of counters & Stopwatches	
<b>Calibration of Portable Appliance Testers</b>				
Earth Bond	<i>At 50 Hz:</i> 0.05 Ω 0.09 Ω 0.1 Ω 0.115 Ω 0.2 Ω 0.33 Ω 0.45 Ω 0.5 Ω 0.575 Ω 1.0 Ω 3.3 Ω 5.0 Ω 10 Ω 15 Ω 18 Ω	1.2 % 0.67 % 0.62 % 0.54 % 0.34 % 0.30 % 0.28 % 0.24 % 0.25 % 0.20 % 0.29 % 0.24 % 0.19 % 0.18 % 0.18 %		
Insulation Resistance	<i>At DC:</i> 0.25 MΩ 0.5 MΩ 1.0 MΩ 2.0 MΩ 4.0 MΩ 5.0 MΩ 6.0 MΩ 10 MΩ 15 MΩ 18 MΩ 50 MΩ 90 MΩ	0.25 % 0.13 % 0.077 % 0.060 % 0.062 % 0.066 % 0.052 % 0.051 % 0.068 % 0.064 % 0.083 % 0.12 %		
Insulation Resistance Test Voltage	100 V 250 V 500 V 1000 V	0.094 % 0.073 % 0.13 % 0.11 %		
Leakage Current	<i>DC:</i> 0 μA to 320 μA 320 μA to 3.2 mA 3 mA to 32 mA	0.12 % + 0.051 μA 0.069 % + 0.23 μA 0.11 % + 2.3 μA		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
<b>Calibration of Portable Appliance Testers</b> (continued)				
Leakage Current (continued)	<i>50 Hz to 60 Hz:</i> 0 mA to 1.6 mA 1.6 mA to 16 mA 16 mA to 20 mA	0.29 % + 0.40 $\mu$ A 0.35 % + 3.8 $\mu$ A 0.35 % + 39 $\mu$ A	These capabilities also apply to flash testers and high voltage meters.	Peterlee
Flash Test	<i>DC, 50 Hz and 60 Hz:</i>  Current (0 mA to 32 mA)  Voltage ( <i>AC, 50 Hz and 60 Hz</i> ) 1 kV 1.5 kV 2 kV 3 kV 4 kV 5 kV  Voltage ( <i>DC</i> ) 1 kV 2 kV 3 kV 4 kV 5 kV 6 kV	See <i>Leakage Current</i> above  12 V 13 V 17 V 21 V 28 V 35 V  10 V 12 V 13 V 14 V 20 V 32 V		
Load Test	<i>At 50 Hz:</i> 1 kVA and 3 kVA nominal	3.3 % + 0.0020 kVA		
<b>Calibration of RCD Testers</b>				
Trip Current	<i>At 50 Hz:</i> 10 mA to 100 mA 100 mA to 2 A	1.4 % + 0.083 mA 1.4 % + 0.83 mA		
Trip Time	20 ms to 100 ms 100 ms to 400 ms 400 ms to 700 ms 700 ms to 900 ms	0.96 ms 1.5 ms 4.8 ms 8.5 ms		
<b>Calibration of Loop Testers</b>				
Loop impedance	<i>At 50 Hz:</i> 0.5 $\Omega$ to 1 $\Omega$ 5 $\Omega$ 10 $\Omega$ 100 $\Omega$ 1 k $\Omega$	12 m $\Omega$ 36 m $\Omega$ 65 m $\Omega$ 0.65 $\Omega$ 6.1 $\Omega$		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
<b>Calibration of Seaward PV100/PV150 solar installation meters</b>			The accreditation for calibration of these instruments includes the expression of opinions relating to the effects of storage periods of up to six months on the calibration validity.	Peterlee
Insulation Resistance	0.5 MΩ 1 MΩ 10 MΩ 90 MΩ 190 MΩ	10 kΩ 10 kΩ 100 kΩ 100 kΩ 1.0 MΩ	At 500 V DC	
	0.25 MΩ 90 MΩ	10 kΩ 1.0 MΩ	At 250 V DC	
	1 MΩ	10 kΩ	At 1000 V DC	
Insulation Voltage	250 V 500 V	1.0 V 1.0 V	Into 1 mA load Into 1 mA load	
Continuity Resistance	0.67 Ω 1.2 Ω 10.5 Ω 100 Ω 190 Ω	10 mΩ 10 mΩ 100 mΩ 1.0 Ω 1.0 Ω		
Current clamp input	100 mV (10 A simulation) 199 mV (20 A simulation) 500 mV (50 A simulation)	100 mA 100 mA 100 mA	Simulation of current clamp at 100 A/V	
RPE Voltage	110 V 240 V 420 V	1.0 V 1.0 V 1.0 V		
Open circuit panel voltage	10.9 V 49.9 V 202 V 440 V 640 V 900 V	100 mV 100 mV 1.0 V 1.0 V 1.0 V 1.0 V	DC Voltage	
Short circuit current	0.97 A 2.7 A 8 A	10 mA 20 mA 50 mA	DC Current	





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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
<b>Calibration of defibrillator testers</b>				
Energy	0 J to 10 J 10 J to 30 J 30 J to 150 J 150 J to 360 J	1.1 % + 0.1 J 1.0 % + 0.22 J 1.0 % + 0.64 J 1.0 % + 0.83 J		
<b>Calibration of temperature indicators</b> By electrical simulation				
Supporting ambient temperature measurement	17 °C to 23 °C	0.22 °C		
PT100 indicators	-200 °C to -70 °C -70 °C to +260 °C  260 °C to 500 °C 500 °C to 850 °C	0.0029 °C 0.0041 °C  0.0054 °C 0.0060 °C		
PT25 indicators	-200 °C to -70 °C -70 °C to +500 °C 500 °C TO 850 °C	0.0061 °C 0.0072 °C 0.0077 °C		
Type K thermocouple indicator simulation	-270 °C to -220 °C -200 °C to -70 °C -70 °C to +1370 °C	2.4 °C 0.83 °C 0.75 °C	Including reference junction compensation	
<b>Calibration of Medical Safety Analysers</b>				
Earth Bond Resistance	At 50 Hz 0.1 Ω 0.33 Ω 0.5 Ω 1 Ω 1.8 Ω 18 Ω	0.024 Ω 0.047 Ω 0.058 Ω 0.025 Ω 0.047 Ω 0.085 Ω		
Earth Bond Current	2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 20 A	0.12 % + 0.58 mA 0.12 % + 5.8 mA 0.19 % + 6.1 mA 0.23 % + 24 mA		
				Peterlee



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code	
<b>Calibration of Medical Safety Analysers (continued)</b>					
Insulation Resistance	<i>At DC</i> 0.01 MΩ to 5 MΩ 5 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 2000 MΩ	0.35 % + 5.8 kΩ 3.5 % + 5.8 kΩ 3.5 % + 15 kΩ 3.5 % + 0.37 MΩ		Peterlee	
Insulation Resistance Test Voltage	100 V to 1000 V	0.35 % + 67 mV			
Leakage Current	<i>DC</i> 0 μA to 200 μA 200 μA to 2 mA 2 mA to 20 mA	0.021 % + 0.58 μA 0.018 % + 0.60 μA 0.018 % + 1.6 μA			
	<i>AC 50 to 60 Hz</i> 20 μA to 200 μA 200 μA to 2 mA 2 mA to 20 mA	0.12 % + 1.0 μA 0.14 % + 2.3 μA 0.13 % + 36 μA			
Voltage Measurement	<i>AC 50 to 60 Hz</i> 20 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V	0.10 % + 0.58 mV 0.093 % + 0.73 mV 0.081 % + 7.2 mV 0.093 % + 48 mV			
Load	0.13 kVA	0.010 kVA			
<b>Calibration of Seaward Apollo 600 Portable Appliance Testers</b>					
Earth Bond Resistance	0.05 Ω to 19.99 Ω	0.015 % + 6.0 mΩ	The accreditation for calibration of these instruments includes the expression of opinions relating to the effects of storage periods of up to six months on the calibration validity.		
Earth Bond Test Current	0 mA to 250 mA DC	0.037 % + 0.58 mA			
Earth Bond Test Voltage	0 V to 10 VDC	0.0042 % + 0.58 mV			
Insulation Resistance	0.1 MΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 20 MΩ	0.019 % + 5.8 kΩ 0.065 % + 5.8 kΩ 0.91 % + 7.5 kΩ			
Insulation Voltage	0 V to 750 V DC	0.012 % + 0.058 V			
Insulation Current	0 mA to 2 mA DC	0.014 % + 5.8 μA			
Differential Leakage Current	0.20 mA to 10mA DC 10mA to 20 mA DC	0.14 % + 5.6 μA 0.13 % + 64 μA			
Touch Leakage Current	0.10 mA to 3.50 mA DC	0.14 % + 5.6 μA			



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code	
<b>Calibration of Seaward Apollo 600 Portable Appliance Testers (ctd.)</b>					
Substitute Leakage Current	0.20 mA to 20 mA, 50 Hz	0.14 % + 24 µA		Peterlee	
Substitute Leakage Test Voltage	0 V to 50 V, 50 Hz	0.069 % + 25 mV			
Load Test Voltage	0 V to 250 V, 50 Hz	0.069 + 0.63 V			
Load Test Current	0 A to 16 A, 50 Hz	1.2 % + 0.24 A			
RCD Test Time	10 ms 20 ms 500 ms	0.13 ms 0.26 ms 4.5 ms			
RCD Test Current	0 mA to 165 mA, 50 Hz	0.25 % + 47 µA			
<b>Calibration of HV Neon Indicators</b>					
Leakage Current	0 µA to 600 µA 600 µA to 6000 µA	1.4 % + 1.6 µA 1.4 % + 14 µA			
<b>Calibration of DC Power Supplies</b>					
Output Voltage	0 V to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.0052 % + 0.58 mV 0.0048 % + 0.58 mV 0.0061 % + 1.0 mV 0.0061 % + 59 mV			
Output Current	0 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 10 A 10A to 20 A	0.060 % + 0.58 mA 0.059 % + 0.58 mA 0.12 % + 0.59 mA 0.068 % + 4.9 mA 0.068 % + 7.9 mA			
<b>PRESSURE CALIBRATION</b>					
Gas Pressure, Gauge			Methods consistent with EURAMET CG17		
Calibration of pressure indicating instruments and gauges	-85 kPa to -3 kPa 0.0 Pa to 20 kPa 20 kPa to 3.5 MPa	170 Pa/MPa + 12 Pa 57 Pa/MPa + 23 Pa 73 Pa/MPa + 12 Pa			
Gas Pressure, Absolute					
Calibration of pressure indicating instruments and gauges	15 kPa to 100 kPa 100 kPa to 120 kPa 120 kPa to 3.6 MPa	170 Pa/MPa + 470 Pa 57 Pa/MPa + 23 Pa 70 Pa/MPa + 470 Pa			



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
<b>CALIBRATIONS CONDUCTED AT CUSTOMERS' PREMISES</b>				
<b>ELECTRICAL CALIBRATION</b>				
DC VOLTAGE				Customers' premises and Peterlee
Generation	0 mV to 200 mV	0.0084 % + 7.0 $\mu$ V	Values can be generated for the calibration of measuring instruments	
	200 mV to 2 V	0.0073 % + 55 $\mu$ V		
	2 V to 20 V	0.0073 % + 0.47 mV		
	20 V to 200 V	0.0074 % + 4.7 mV		
	200 V to 1000V	0.0074 % + 31 mV		
Measurement	Up to 100 mV	0.0068 % + 5.7 $\mu$ V	For measurement of instrument outputs	
	100 mV to 1 V	0.0058 % + 10 $\mu$ V		
	1 V to 10 V	0.0051 % + 82 $\mu$ V		
	10 V to 100 V	0.0063 % + 0.91 mV		
	100 V to 1000 V	0.0063 % + 13 mV		
DC RESISTANCE				
Generation			Values can be generated for the calibration of measuring instruments	
	10 $\Omega$	59 m $\Omega$	Nominal values obtained from a multi-function calibrator for calibration of multimeters, resistance meters etc.	
	100 $\Omega$	67 m $\Omega$		
	1 k $\Omega$	0.17 $\Omega$		
	10 k $\Omega$	1.2 $\Omega$		
	100 k $\Omega$	12 $\Omega$		
	1 M $\Omega$	0.24 k $\Omega$		
	10 M $\Omega$	12 k $\Omega$		
	100 M $\Omega$	0.24 M $\Omega$		
Measurement	Up to 100 $\Omega$	0.12 % + 13 m $\Omega$		For measurement of instrument outputs
	100 $\Omega$ to 1 k $\Omega$	0.12 % + 95 m $\Omega$		
	1 $\Omega$ to 10 k $\Omega$	0.12 % + 0.95 $\Omega$		
	10 k $\Omega$ to 100 k $\Omega$	0.12 % + 9.5 $\Omega$		
	100 k $\Omega$ to 1 M $\Omega$	0.12 % + 0.16 k $\Omega$		
	1 M $\Omega$ to 10 M $\Omega$	0.47 % + 4.6 k $\Omega$		
	10 M $\Omega$ to 100 M $\Omega$	1.1 % + 0.60 M $\Omega$		
AC VOLTAGE				
Generation	20 mV to 200 mV		Values can be generated for the calibration of measuring instruments	
	45 Hz to 1 kHz	0.056 % + 49 $\mu$ V		
	1 kHz to 2 kHz	0.092 % + 67 $\mu$ V		
	2 kHz to 10 kHz	0.15 % + 0.30 mA		
	200 mV to 2 V			
	45 Hz to 1 kHz	0.070 % + 0.53 mV		
	1 kHz to 2 kHz	0.095 % + 0.55 mV		
	2 kHz to 10 kHz	0.13 % + 0.94 mV		



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**United Kingdom Accreditation Service**  
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

**Seaward Electronic Ltd**  
**Issue No: 025 Issue date: 30 August 2022**

**Calibration performed by the Organisation at the locations specified**

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
AC VOLTAGE (continued)				
Generation (continued)	2 V to 20 V 45 Hz to 1 kHz 1 kHz to 2 kHz 2 kHz to 10 kHz	0.069 % + 5.3 mV 0.087 % + 5.5 mV 0.15 % + 9.4 mV		
	20 V to 200 V 45 Hz to 1 kHz 1 kHz to 2 kHz 2 kHz to 10 kHz	0.087 % + 53 mV 0.12 % + 70 mV 0.19 % + 0.10 mV		
	200 V to 1000 V 45 Hz to 1 kHz	0.080 % + 0.30 V		
Measurement	10 mV to 100 mV		For measurement of instrument outputs	
	45 Hz to 1 kHz 1 kHz to 10 kHz	0.082 % + 57 µV 0.11 % + 72 µV		
	100 mV to 1 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.080 % + 0.38 mV 0.10 % + 0.40 mV		
	1 V to 10 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.080 % + 3.8 mV 0.096 % + 4.0 mV		
	10 V to 100 V 45 Hz to 1 kHz 1 kHz to 10 kHz	0.080 % + 37 mV 0.11 % + 59 mV		
	100 V to 750 V 45 Hz to 1 kHz	0.080 % + 0.29 mV		
	5 kV to 50 kV 50 Hz	1.0 % + 2.0 V		
DC CURRENT				
Generation	0 A to 200 µA	0.019 % + 40 nA	Values can be generated for the calibration of measuring instruments	
	200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 20 A	0.017 % + 0.17 µA 0.017 % + 1.6 µA 0.018 % + 19 µA 0.069 % + 0.36 mA 0.055 % + 1.4 mA		
Calibration of clamp-on ammeters using multi-turn coil	20A to 200 A 200 A to 1000A	0.53 % + 0.49 A 0.53 % + 0.49 A	Hall Effect Clamps	
Measurement	0 A to 10 mA	0.058 % + 7.3 µA	For measurement of instrument outputs	
	10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.059 % + 19 µA 0.12 % + 0.13 mA 0.14 % + 0.87 mA		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
AC CURRENT				Customers' premises and Peterlee
Generation	45 Hz to 200 Hz		Values can be generated for the calibration of measuring instruments	
	20 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	0.13 % + 0.57 µA 0.079 % + 1.9 µA 0.078 % + 35 µA 0.085 % + 0.19 mA 0.12 % + 1.8 mA		
	45 Hz to 200 Hz 2 A to 20 A	0.19% + 9.3 mA		
Calibration of clamp-on ammeters using multi-turn coil	50 to 60 Hz 20 A to 200 A 200 A to 1000A	0.33 % + 46 mA 0.32 % + 46 mA	Wound Clamp	
	20 A to 200 A 200 A to 1000 A	0.56 % + 0.49 A 0.55 % + 0.60 A	Hall Effect Clamps	
Measurement	45 Hz to 500 Hz		For measurement of instrument outputs	
	50 mA to 1 A 1 A to 2 A	0.16 % + 0.68 mA 0.20 % + 2.2 mA		
Frequency				
Measurement	1 Hz to 10 Hz 10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 100 MHz 100 MHz to 1 GHz	0.0017 % + 1.3 mHz 0.0017 % + 1.3 mHz 0.0017 % + 1.2 mHz 0.0017 % + 1.2 mHz 0.0017 % + 1.4 mHz 0.0017 % + 8.3 mHz 0.0017 % + 82 mHz 0.0017 % + 0.82 Hz 0.0017 % + 8.2 Hz	For measurement of instrument outputs	
Calibration of Oscilloscopes				
Vertical Deflection	2 mV / division 5 mV / division 10 mV / division 20 mV / division 50 mV / division 100 mV / division 200 mV / division 500 mV / division 1 V / division 2 V / division 5 V / division 10 V / division 20 V / division 50 V / division	34 µV 40 µV 51 µV 80 µV 0.18 mV 0.35 mV 0.70 mV 1.7 mV 3.5 mV 7.0 mV 17 mV 35 mV 82 mV 0.20 V		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC)	Remarks	Location Code
<b>Calibration of Oscilloscopes</b> (continued)				Customers' premises and Peterlee
Timebase	5 ns / division 10 ns / division 20 ns / division 50 ns / division 100 ns / division 200 ns / division 500 ns / division 1 µs / division 2 µs / division 5 µs / division 10 µs / division 20 µs / division 50 µs / division 100 µs / division 200 µs / division 500 µs / division 1 ms / division 2 ms / division 5 ms / division 10 ms / division 20 ms / division 50 ms / division 100 ms / division 200 ms / division 500 ms / division 1 s / division	0.085 % 0.083 % 0.083 % 0.085 % 0.083 % 0.083 % 0.085 % 0.083 % 0.083 % 0.085 % 0.083 % 0.083 % 0.085 % 0.083 % 0.083 % 0.085 % 0.083 % 0.083 % 0.085 % 0.083 % 0.083 % 0.085 % 0.084 % 0.089 % 0.11 % 0.17 %		
<b>Calibration of Portable Appliance Testers</b>				
Earth Bond	<i>At 50 to 60 Hz</i> 0.05 Ω 0.1 Ω 0.5 Ω 1 Ω 1.8 Ω 10 Ω 18 Ω	1.0 mΩ 1.0 mΩ 1.4 mΩ 2.3 mΩ 8.9 mΩ 23 mΩ 36 mΩ		
Insulation Resistance	<i>At DC</i> 10 kΩ to 2 MΩ 2 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 2 GΩ	0.12 % + 0.58 kΩ 1.2 % + 0.66 kΩ 1.2 % + 15 kΩ 1.2 % + 0.37 MΩ	These capabilities also apply to insulation testers.	
Insulation Resistance Test Voltage	100 V to 1000 V	0.19 % + 0.58 V		



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