

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

 <p>0809</p> <p>Accredited to ISO/IEC 17025:2005</p>	<h3>Seaward Electronic Ltd</h3> <p>Issue No: 004 Issue date: 1 December 2009</p>	
	<p>Bracken Hill South West Industrial Estate Peterlee County Durham SR8 2SW</p>	<p>Contact: Mr M Steele Tel: +44 (0) 191 586 3511 Fax: +44 (0) 191 586 0227 E-Mail: service@seaward.co.uk Website: www.seaward.co.uk</p>
<p>Calibration performed at the above address only</p>		

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ($k=2$)	Remarks
DC VOLTAGE			
Generation	Up to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	31 ppm + 3.7 μ V 32 ppm + 4.8 μ V 26 ppm + 45 μ V 31 ppm + 0.46 mV 31 ppm + 4.6 mV	
Measurement	Up to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	23 ppm + 3.0 μ V 14 ppm + 3.0 μ V 15 ppm + 9.3 μ V 31 ppm + 560 μ V 27 ppm + 0.81 mV	
DC RESISTANCE			
Generation	10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω	0.16% 70 ppm 87 ppm 43 ppm 82 ppm 150 ppm 400 ppm	<p>Nominal values obtained from a multi-function calibrator for calibration of multimeters, resistance meters etc.</p>
	100 $\mu\Omega$ 1 m Ω 10 m Ω 100 m Ω 1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω	20 ppm 15 ppm 8.0 ppm 7.6 ppm 6.9 ppm 6.6 ppm 13 ppm 7.7 ppm 10 ppm 6.5 ppm 7.9 ppm	
			<p>Standard resistors available for calibration of resistance bridges, long-scale multimeters etc.</p>



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ($k=2$)	Remarks
DC RESISTANCE (continued)			
Measurement	1 m Ω 10 m Ω 100 m Ω 1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω	46 ppm 12 ppm 9.4 ppm 6.9 ppm 6.6 ppm 13 ppm 8.2 ppm 10 ppm 8.0 ppm 11 ppm	Calibration of standard resistors
	100 $\mu\Omega$ to 2 m Ω 2 m Ω to 20 m Ω 20 m Ω to 200 m Ω 200 m Ω to 2 Ω 2 Ω to 20 Ω 20 Ω to 200 Ω 200 Ω to 2 k Ω 2 k Ω to 20 k Ω 20 k Ω to 200 k Ω 200 k Ω to 2 M Ω 2 M Ω to 20 M Ω 20 M Ω to 200 M Ω 200 M Ω to 2 G Ω	0.030 % 32 ppm 20 ppm 7.2 ppm 6.9 ppm 13 ppm 8.8 ppm 11 ppm 9.8 ppm 12 ppm 0.030% + 14 Ω 0.064% + 0.70 k Ω 0.56% + 17 k Ω	
High resistance/high voltage Measurement	0.1 M Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω 1 G Ω to 10 G Ω 10 G Ω to 100 G Ω 100 G Ω to 1 T Ω	0.060 % 0.059 % 0.061 % 0.053 % 0.054 % 0.072 % 0.25 %	The applied voltages will be in the range 10 V to 1000 V DC
	1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω 1 G Ω to 10 G Ω 10 G Ω to 100 G Ω 100 G Ω to 1 T Ω	0.32 % 0.31 % 0.31 % 0.31 % 0.37 % 0.44 %	



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AC VOLTAGE			
Generation	20 mV to 200 mV 40 Hz to 1 kHz 1 kHz to 10 kHz	0.043% + 38 μ V 0.085% + 51 μ V	
	200 mV to 2 V 40 Hz to 1 kHz 1 kHz to 10 kHz	0.038% + 0.11 mV 0.071% + 0.16 mV	
	2 V to 20 V 40 Hz to 1 kHz 1 kHz to 10 kHz	0.036% + 1.0 mV 0.061% + 1.6 mV	
	20 V to 200 V 40 Hz to 1 kHz 1 kHz to 10 kHz	0.038% + 8.7 mV 0.083% + 46 mV	
	200 V to 1000 V 40 Hz to 1 kHz	0.038% + 87 mV	Minimum frequency 46 Hz above 700 V
Measurement	20 mV to 200 mV 50 Hz to 100 Hz 100 Hz to 2 kHz 2 kHz to 10 kHz	0.082% + 37 μ V 0.030% + 26 μ V 0.025% + 26 μ V	
	200 mV to 2 V 50 Hz to 100 Hz 100 Hz to 2 kHz 2 kHz to 10 kHz	0.082% + 350 μ V 0.025% + 230 μ V 0.025% + 230 μ V	
	2 V to 20 V 50 Hz to 100 Hz 100 Hz to 2 kHz 2 kHz to 10 kHz	0.082% + 3.5 mV 0.037% + 3.5 mV 0.048% + 3.5 mV	
	20 V to 200 V 50 Hz to 100 Hz 100 Hz to 2 kHz 2 kHz to 10 kHz	0.082% + 35 mV 0.036% + 35 mV 0.047% + 35 mV	
	200 V to 750 V 50 Hz to 100 Hz 100 Hz to 2 kHz	0.12% + 130 mV 0.061% + 130 mV	



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DC CURRENT			
Generation	Up to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 20 A	94 ppm + 37 nA 83 ppm + 68 nA 57 ppm + 0.69 μ A 120 ppm + 3.6 μ A 0.015% + 40 μ A 0.058% + 0.79 mA	Calibration of clamp-on ammeters using multi-turn coil.
Measurement	20 A to 100 A 100 A to 1000 A	0.49% + 5.8 mA 0.48% + 98 mA	
Generation	Up to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	410 ppm + 8.2 nA 410 ppm + 47 nA 410 ppm + 0.46 μ A 430 ppm + 4.6 μ A 870 ppm + 74 μ A	
Measurement			
AC CURRENT			
Generation	<i>40 Hz to 500 Hz:</i> 20 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	0.13% + 0.50 μ A 0.10% + 0.62 μ A 0.095% + 4.6 μ A 0.095% + 46 μ A 0.11% + 0.46 mA	Calibration of clamp-on ammeters using multi-turn coil.
Measurement	<i>40 Hz to 100 Hz:</i> 2 A to 20 A	0.060% + 2.9 mA	
Generation	<i>40 Hz to 60 Hz:</i> 20 A to 100 A 100 A to 1000 A	0.43% + 76 mA 0.48% + 1.6 A	
Measurement	<i>50 Hz to 200 Hz:</i> 20 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	0.24% + 410 nA 0.18% + 530 nA 0.18% + 3.5 μ A 0.18% + 35 μ A 0.24% + 350 μ A	



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Calibration of Portable Appliance Testers			
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 M Ω 0.5 M Ω 1.0 M Ω 2.0 M Ω 4.0 M Ω 5.0 M Ω 6.0 M Ω 10 M Ω 15 M Ω 18 M Ω 50 M Ω 90 M Ω	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, 50 Hz to 60 Hz:</i> Up to 300 μ A 300 μ A to 3 mA 3 mA to 20 mA	0.60 % + 0.36 μ A 0.26 % + 3.6 μ A 0.27 % + 35 μ A	
Flash Test	<i>DC, 50 Hz and 60 Hz:</i> Current (up to 20 mA) Voltage, 1 kV to 5 kV	 See <i>Leakage Current</i> above 1.0 % + 5 V	<div style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px;"> This capability also applies to flash testers and high voltage meters. </div>
Load Test	<i>At 50 Hz:</i> 1 kVA and 3 kVA nominal	1.5 % + 0.015 kVA	



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Calibration of RCD Testers			
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	
Calibration of Loop Testers			
Loop impedance	<i>At 50 Hz:</i> 0.5 Ω to 2 k Ω	0.80 % + 4.6 m Ω	
END			