

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>0126</p> <p>Accredited to ISO/IEC 17025:2005</p>	<h3>Electroservices (Instruments) Ltd</h3> <p>Issue No: 026 Issue date: 07 February 2009</p>	
	<p>Calibration House William Brown Close Llantarnam Park Cwmbran Wales NP44 3AB</p>	<p>Contact: Mr R A Jones Tel: +44 (0)1633 486920 Fax: +44 (0)1633 486921 E-Mail: sales@e-sltd.co.uk Website: www.electroservices.biz/</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 RESISTANCE			
Spot values	1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω 1 G Ω 10 G Ω 100 G Ω 1 T Ω	5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 30 ppm 30 ppm 30 ppm 0.5% 0.5% 0.5% 0.65%	
Range Values	0 to 0.5 Ω 0.5 to 5 Ω 5 Ω to 50 Ω 50 Ω to 500 Ω 500 Ω to 5 k Ω 5 k Ω to 50 k Ω 50 k Ω to 500 k Ω 500 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 10 G Ω 10 G Ω to 100 G Ω 100 G Ω to 1 T Ω	7.5 ppm + 0.25 $\mu\Omega$ 7.4 ppm 5.4 ppm 5.4 ppm 5.4 ppm 5.4 ppm 5.4 ppm 5.4 ppm 5.4 ppm 7.2 ppm 360 ppm 0.1% 0.2% 0.45%	
DC VOLTAGE			
Standard Cell Values		1.0 μV	The stated uncertainty can be realised with cells only if they have their own temperature-controlled enclosure of appropriate thermal stability



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DC VOLTAGE (cont'd)			
Other Values	0 V to 11 V 11 V to 110 V 110 V to 1100 V	2.8 ppm + 0.3 μ V 2.8 ppm 3.2 ppm	
DC CURRENT	100 nA to 10 μ A 10 μ A to 2 A 2 A to 10 A	13 ppm + 5 pA 7 ppm 60 ppm	
Clamp meters	10 A to 100 A 100A to 1000A	0.26 % + 0.6 A	
AC VOLTAGE			
Generation	<i>1 mV to 3 mV</i> 10 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.15% 0.2% 0.35% 0.75%	
	<i>3 mV to 10 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.05% 0.032% 0.075% 0.2% 0.5%	
	<i>10 mV to 30 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.045% 0.055% 0.16% 0.2% 0.4%	
	<i>30 mV to 100 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.03% 0.017% 0.04% 0.1% 0.25%	
	<i>100 mV to 300 mV</i> 10 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.006% 0.02% 0.048% 0.12%	
	<i>300 mV to 30 V</i> 10 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.005% 0.01% 0.04% 0.11%	
	<i>30 V to 100 V</i> 10 Hz to 30 kHz 30 kHz to 200 kHz	0.0043% 0.011%	



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AC VOLTAGE (cont'd)			
Generation (cont'd)	300 V to 1100 V 10 Hz to 30 kHz 30 kHz to 200 kHz	0.0082% 0.02%	
	100 V to 300 V 10 Hz to 30 kHz 30 kHz to 200 kHz	0.0074% 0.02%	
Measurement			
Specific Values	100 mV 1 kHz, 30 kHz 60 kHz, 100 kHz 500 kHz 1 MHz	0.005% 0.0075% 0.036% 0.088%	
	300 mV 10 Hz 40 Hz 1 kHz, 30 kHz 50 kHz, 100 kHz 500 kHz 1 MHz	0.0035% 0.003% 0.0035% 0.0067% 0.027% 0.068%	
	1 V 10 Hz 40 Hz, 1 kHz, 30 kHz 60 kHz, 100 kHz 500 kHz 1 MHz	0.0035% 0.003% 0.0062% 0.026% 0.068%	
	3 V 10 Hz 40 Hz, 1 kHz, 30 kHz 50 kHz, 100 kHz 500 kHz 1 MHz	0.0037% 0.003% 0.0063% 0.028% 0.064%	
	10 V 10 Hz 40 Hz 1 kHz, 30 kHz 60 kHz, 100 kHz 500 kHz 1 MHz	0.0035% 0.0033% 0.003% 0.0062% 0.026% 0.064%	
	30 V 10 Hz 40 Hz 1 kHz, 30 kHz 50 kHz, 100 kHz 500 kHz 1 MHz	0.0035% 0.0037% 0.0032% 0.0067% 0.027% 0.079%	



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AC VOLTAGE (cont'd)			
Measurement (cont'd)			
Specific Values (cont'd)	<i>100 V</i> 10 Hz 40 Hz 1 kHz, 30 kHz 60 kHz, 100 kHz <i>300 V</i> 45 Hz, 1 kHz, 5 kHz, 10 kHz, 15 kHz, 20 kHz 33 kHz, 50 kHz, 100 kHz <i>1000 V</i> 45 Hz, 1 kHz, 5 kHz, 10 kHz 15 kHz, 20 kHz 30 kHz, 33 kHz 50 kHz, 100 kHz	0.004% 0.0035% 0.0032% 0.0067% 0.012% 0.013% 0.013% 0.013% 0.014% 0.016%	
Other Values	<i>1 mV to 3 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz <i>3 mV to 10 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz <i>10 mV to 30 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz <i>30 mV to 100 mV</i> 10 Hz to 100 Hz 100 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz <i>100 mV to 300 mV</i> 10 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz	0.16% 0.14% 0.2% 0.36% 0.72% 0.05% 0.035% 0.08% 0.21% 0.5% 0.04% 0.025% 0.06% 0.16% 0.38% 0.03% 0.015% 0.03% 0.1% 0.25% 0.005% 0.011% 0.05% 0.13%	



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AC VOLTAGE (cont'd) Measurement (cont'd) Other Values (cont'd)	<i>300 mV to 30 V</i> 10 Hz to 30 kHz 30 kHz to 200 kHz 200 kHz to 500 kHz 500 kHz to 1 MHz <i>30 V to 100 V</i> 10 Hz to 30 kHz 30 kHz to 200 kHz <i>100 V to 300 V</i> 10 Hz to 30 kHz 30 kHz to 200 kHz <i>300 V to 1100 V</i> 10 Hz to 30 kHz 30 kHz to 200 kHz	0.005% 0.02% 0.05% 0.12% 0.005% 0.01% 0.013% 0.017% 0.013% 0.021%	
AC CURRENT	<i>50 Hz to 100 Hz</i> 25 µA to 250 µA <i>50 Hz to 1 kHz, 5 kHz</i> 250 µA to 2 A <i>50 Hz to 400 Hz, 5 kHz</i> 2 A to 10 A	0.03% 0.03% 0.03%	
Clamp meters	<i>10 Hz to 50 Hz</i> 10 A to 100 A 100A to 1000A	0.26 % + 0.6 A	
AC POWER	<i>50 Hz to 60 Hz, 400 Hz, 5 kHz</i> 50 mW to 4 kW 4 kW to 10 kW	0.052% 0.2%	At unity power factor. Power factors of 0.9, 0.5 0.1 and 0.01 can be measured with greater uncertainties.
FREQUENCY	10 MHz clock frequency 0.1 Hz to 1 Hz 1 Hz to 10 Hz 10 Hz to 100 Hz 100 Hz to 10 kHz 10 kHz to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 150 MHz 150 MHz to 1 GHz	1 in 10 ¹⁰ 5 in 10 ⁴ 5 in 10 ⁵ 5 in 10 ⁶ 5 in 10 ⁷ 1 in 10 ⁶ 1 in 10 ⁷ 1 in 10 ⁸ 1 in 10 ⁹ 1 Hz	Multi-period measurement Frequency measurement



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PHASE ANGLE	50 Hz to 10 kHz 0° to 360°	0.05°	
CAPACITANCE			
Sourcing			
Specific Values			
1 nF, 10 nF, 100 nF	100 Hz, 1 kHz, 10 kHz	0.03%	
1 μF	100 Hz, 1 kHz	0.03%	
1 μF	10 kHz	0.04%	
10 μF, 100 μF	100 Hz, 1 kHz	0.05%	
Other Frequencies			
1 nF, 10 nF, 100 nF	100 Hz to 10 kHz	0.04%	
1 μF, 10 μF, 100 μF	100 Hz to 1 kHz	0.05%	
Measurement			
Specific Values			
1 nF, 10 nF, 100 nF	100 Hz, 1 kHz, 10 kHz	0.03%	
1 μF	100 Hz, 1 kHz	0.03%	
1 μF	10 kHz	0.04%	
10 μF, 100 μF	100 Hz, 1 kHz	0.05%	
Other Values and Frequencies			
10 pF to 100 pF	1 kHz to 10 kHz	0.2%	
100 pF to 1 μF	100 Hz to 10 kHz	0.1%	
1 μF to 100 μF	100 Hz to 1 kHz	0.1%	
INDUCTANCE			
Sourcing			
Specific Values			
10 μH	1 kHz, 10 kHz	0.25%	
100 μH	1 kHz, 10 kHz	0.06%	
1 mH	100 Hz	0.07%	
1 mH	1 kHz, 10 kHz	0.05%	
10 mH	1 kHz, 10 kHz	0.05%	
100 mH	100 Hz, 10 kHz	0.07%	
100 mH	1 kHz	0.05%	
1 H	100 Hz	0.25%	
1 H	1 kHz	0.05%	



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INDUCTANCE (cont'd)			
Other Frequencies			
10 μ H	1 kHz to 10 kHz	0.25%	
100 μ H	1 kHz to 10 kHz	0.1%	
1 mH, 10 mH, 100 mH	100 Hz to 10 kHz	0.1%	
1 H	100 Hz to 1 kHz	0.25%	
Measurement			
Specific Values			
10 μ H	1 kHz, 10 kHz	0.25%	
100 μ H	1 kHz, 10 kHz	0.06%	
1 mH	100 Hz	0.07%	
1 mH	1 kHz, 10 kHz	0.05%	
10 mH	1 kHz, 10 kHz	0.05%	
100 mH	100 Hz, 10 kHz	0.07%	
100 mH	1 kHz	0.05%	
1 H	100 Hz	0.25%	
1 H	1 kHz	0.05%	
Other Values and Frequencies			
10 μ H to 1 mH	1 kHz to 10 kHz	0.25%	
1 mH to 100 mH	100 Hz to 10 kHz	0.15%	
100 mH to 1 H	100 Hz to 1 kHz	0.25%	
Temperature indicators, calibration by electrical simulation			
Base metal thermocouple	-270 °C to 1370 °C	0.12 °C	Including cold junction compensation
Noble metal thermocouple	0 °C to 200 °C 200 °C to 800 °C 800 °C to 1760 °C	0.6 °C 0.5 °C 1.0 °C	Including cold junction compensation
END			