


# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

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

 <p style="text-align: center;"><b>UKAS</b> CALIBRATION</p> <p style="text-align: center;"><b>0078</b></p> <p style="text-align: center;">Accredited to <b>ISO/IEC 17025:2005</b></p>	<h3 style="margin: 0;">Absolute Calibration Limited</h3> <p style="margin: 0;">Issue No: 038    Issue date: 01 April 2009</p>	
	<p><b>14 Murrills Estate</b> <b>Portchester</b> <b>Hampshire</b> <b>PO16 9RD</b></p>	<p><b>Contact: Mr M R Funnell</b> <b>Tel: +44 (0)2392 321712</b> <b>Fax: +44 (0)2392 210034</b> <b>E-Mail: calit@absolute-cal.co.uk</b> <b>Website: www.absolute-cal.co.uk</b></p>
<p><b>Calibration performed by the Organisations at the locations specified below</b></p>		

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

**Laboratory location:**

Location details	Activity	Location code
<p><b>Address</b></p> <p>14 Murrills Estate Portchester Hampshire PO16 9RD</p> <p><b>Contact</b> Mr M R Funnell</p> <p>Tel: +44 (0) 2392 321712 Fax: +44 (0) 2392 210034 Email: calit@absolute-cal.co.uk Website: www.absolute-cal.co.uk</p>	<p><u>Calibration:</u></p> <p>Electrical Humidity Pressure Temperature</p>	<p><b>Portchester</b></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>Contact</b> Mr M R Funnell</p> <p>Tel: +44 (0) 2392 321712 Fax: +44 (0) 2392 210034 Email: calit@absolute-cal.co.uk Website: www.absolute-cal.co.uk</p>	<p><u>Calibration:</u></p> <p>Electrical Humidity Temperature</p>	<p><b>Site Calibration</b></p>



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DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
<b>ELECTRICAL CALIBRATION</b>				
<b>DC RESISTANCE</b>				
Measurement <i>Specific Values</i>	100 $\mu\Omega$ 1 m $\Omega$ 10 m $\Omega$ 100 m $\Omega$ 1 $\Omega$ 10 $\Omega$ 100 $\Omega$ 1 k $\Omega$ 10 k $\Omega$ 100 k $\Omega$ 1 M $\Omega$ 10 M $\Omega$ 100 M $\Omega$ 1.0 G $\Omega$	4.0 ppm 0.30 ppm 0.30 ppm 0.24 ppm 0.090 ppm 0.080 ppm 0.070 ppm 0.080 ppm 0.22 ppm 0.22 ppm 0.61 ppm 1.8 ppm 4.5 ppm 5.3 ppm	<p>The Best Measurement Capability is for 4-terminal resistors suitable for oil immersion at 20 °C. The uncertainties may be increased for other types of resistor.</p> <p>See note above</p>	Portchester
Other values	80 m $\Omega$ to 800 m $\Omega$ 0.8 $\Omega$ to 107.5 $\Omega$ 107.5 $\Omega$ to 1.34 k $\Omega$ 1.34k $\Omega$ to 10.75 k $\Omega$ 10.75 k $\Omega$ to 12 k $\Omega$ 12 k $\Omega$ to 63 k $\Omega$ 63 k $\Omega$ to 134 k $\Omega$ 134 k $\Omega$ to 1.075 M $\Omega$ 1.075 M $\Omega$ to 13.4 M $\Omega$ 13.4 M $\Omega$ to 630 M $\Omega$ 630 M $\Omega$ to 1.075 G $\Omega$ 1.075 G $\Omega$ to 2.0 G $\Omega$ 2.0 G $\Omega$ to 20 G $\Omega$ 20 G $\Omega$ to 200 G $\Omega$ 200 G $\Omega$ to 2.0 T $\Omega$	0.25 ppm 0.09 ppm 0.08 ppm 0.22 ppm 0.22 ppm 0.22 ppm 0.22 ppm 0.61 ppm 1.9 ppm 4.5 ppm 5.3 ppm 0.021% 0.061% 0.081% 0.10%		
Generation <i>Specific values</i>	100 M $\Omega$ , 300 M $\Omega$ , 1 G $\Omega$ 3 G $\Omega$ 10 G $\Omega$	0.30% 0.45% 0.35%	Applied Voltage 10 V	
	30 G $\Omega$ , 100 G $\Omega$ , 300 G $\Omega$ 1 T $\Omega$ 3 T $\Omega$	0.35% 0.70% 0.75%	Applied Voltage 100 V	
	100 M $\Omega$ , 300 M $\Omega$ , 1 G $\Omega$ 3 G $\Omega$ 10 G $\Omega$ , 30 G $\Omega$ , 100 G $\Omega$ , 300 G $\Omega$	0.30% 0.45% 0.35%	Applied Voltage 500 V	
	1 T $\Omega$ 3 T $\Omega$	0.70% 0.75%	Applied Voltage 500 V	



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
AC RESISTANCE				Porchester
Generation	40 Hz to 1592 Hz			
	0.1 $\Omega$	0.030%	Measurement of suitable resistors of the same nominal values may also be undertaken but the uncertainties may be increased.	
	1.0 $\Omega$	10 ppm		
	10 $\Omega$	6.0 ppm		
	100 $\Omega$	8.0 ppm		
	1.0 k $\Omega$	7.0 ppm		
	10 k $\Omega$	6.0 ppm		
DC VOLTAGE				
Standard Cell Values	1.018V	0.44 ppm	This uncertainty can be realised with cells only if they have their own temperature-controlled enclosure of suitable thermal stability.	
Zener References	1.018V 10V	0.44 ppm 0.23 ppm		
Specific Values	0.1V 1.0 V 10 V 100 V 1 kV	0.61 ppm 0.43 ppm 0.34 ppm 0.40 ppm 0.70 ppm		
Other Values	Up to 100 mV 100 mV to 1.0 V 1.0 V to 10 V 10 V to 100 V 100V to 1.0 kV 1 kV to 10 kV 10 kV to 50 kV	2.5 $\mu$ V 0.45 $\mu$ V 0.44 ppm 0.50 ppm 2.5 ppm 0.030% 0.060%		
DC VOLTAGE RATIO (for ratio component values up to 2 V)	Up to unity	$5 \times 10^{-7}$ of input	Limit of resolution is 50 nV. The stated uncertainty cannot be achieved for every combination of range and ratio component.	
DC CURRENT	1 pA to 10 pA 100 pA to 100 pA 100 pA to 1 nA 1 nA to 10 nA 10 nA to 1 $\mu$ A 1 $\mu$ A to 10 $\mu$ A 10 $\mu$ A to 1 A 1 A to 100 A	0.40 pA 0.40 pA 0.25% + 0.4 pA 0.25% 0.15% 0.060% 50 ppm 100 ppm		



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DC CURRENT (continued)  Specific values for calibration of Wavetek 4950 Multifunction Transfer Standards	100 $\mu$ A 1 mA 10 mA 100 mA 1 A	5.9 ppm 5.7 ppm 5.7 ppm 5.7 ppm 11 ppm		Portchester
AC VOLTAGE  Generation	10 Hz to 31 Hz			
	1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.011% + 0.35 mV 0.012% + 6.0 mV 0.017% + 20 mV		
	32 Hz to 330 Hz			
	Up to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.23% + 6.0 $\mu$ V 0.035% + 6.5 $\mu$ V 0.014% + 15 $\mu$ V 0.0065% + 35 $\mu$ V 0.0063% + 350 $\mu$ V 0.0075% + 2.3 mV 0.017% + 25 mV		
	330 Hz to 10 kHz			
	Up to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.23% + 6.0 $\mu$ V 0.035% + 6.2 $\mu$ V 0.015% + 15 $\mu$ V 0.0055% + 35 $\mu$ V 0.0053% + 350 $\mu$ V 0.0065% + 1.3 mV 0.012% + 25 mV		
	10 kHz to 33 kHz			
	Up to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.25% + 6.0 $\mu$ V 0.05% + 6.5 $\mu$ V 0.025% + 15 $\mu$ V 0.0055% + 35 $\mu$ V 0.0053% + 350 $\mu$ V 0.0065% + 1.3 mV 0.012% + 25 mV		



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AC VOLTAGE (continued) Generation	30 kHz to 100 kHz			Portchester
	Up to 1 mV	0.26% + 6.0 $\mu$ V		
	1 mV to 10 mV	0.07% + 6.5 $\mu$ V		
	10 mV to 100 mV	0.052% + 15 $\mu$ V		
	100 mV to 1 V	0.011% + 35 $\mu$ V		
	1 V to 10 V	0.011% + 350 $\mu$ V		
	10 V to 100 V	0.016% + 3.5 mV		
	100 V to 700 V	0.012% + 50 mV		
	100 kHz to 330 kHz			
	Up to 1 mV	0.3% + 6.0 $\mu$ V		
	1 mV to 10 mV	0.08% + 7.0 $\mu$ V		
	10 mV to 100 mV	0.065% + 20 $\mu$ V		
	100 mV to 1 V	0.035% + 35 $\mu$ V		
	1 V to 10 V	0.031% + 350 $\mu$ V		
	300 kHz to 1 MHz			
	1 V to 10 V	0.18% + 5.0 mV		
Measurement	70 mV to 220 mV			
	10 Hz to 20 Hz	140 ppm + 1.7 $\mu$ V		
	20 Hz to 40 Hz	74 ppm + 1.7 $\mu$ V		
	40 Hz to 20 kHz	54 ppm + 1.7 $\mu$ V		
	20 kHz to 50 kHz	54 ppm + 2.3 $\mu$ V		
	50 kHz to 100 kHz	84 ppm + 2.9 $\mu$ V		
	100 kHz to 300 kHz	240 ppm + 4.6 $\mu$ V		
	300 kHz to 500 kHz	380 ppm + 9.2 $\mu$ V		
	500 kHz to 1 MHz	0.16% + 9.2 $\mu$ V		
	200 mV to 700 mV			
	10 Hz to 20 Hz	140 ppm + 1.7 $\mu$ V		
	20 Hz to 40 Hz	65 ppm + 1.7 $\mu$ V		
	40 Hz to 20 kHz	46 ppm + 1.7 $\mu$ V		
	20 kHz to 50 kHz	48 ppm + 2.3 $\mu$ V		
	50 kHz to 100 kHz	80 ppm + 2.9 $\mu$ V		
	100 kHz to 300 kHz	240 ppm + 4.6 $\mu$ V		
	300 kHz to 500 kHz	390 ppm + 9.2 $\mu$ V		
	500 kHz to 1 MHz	0.16% + 9.2 $\mu$ V		



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AC VOLTAGE (continued) Measurement	700 mV to 2.2 V			Portchester
	10 Hz to 20 Hz	140 ppm		
	20 Hz to 40 Hz	58 ppm		
	40 Hz to 20 kHz	36 ppm		
	20 kHz to 50 kHz	47 ppm		
	50 kHz to 100 kHz	74 ppm		
	100 kHz to 300 kHz	220 ppm		
	300 kHz to 500 kHz	370 ppm		
	500 kHz to 1 MHz	0.16%		
	2 V to 7 V			
	10 Hz to 20 Hz	140 ppm		
	20 Hz to 40 Hz	60 ppm		
40 Hz to 20 kHz	36 ppm			
20 kHz to 50 kHz	47 ppm			
50 kHz to 100 kHz	91 ppm			
100 kHz to 300 kHz	230 ppm			
300 kHz to 500 kHz	560 ppm			
500 kHz to 1 MHz	0.19%			
7 V to 22 V				
10 Hz to 20 Hz	140 ppm			
20 Hz to 40 Hz	61 ppm			
40 Hz to 20 kHz	37 ppm			
20 kHz to 50 kHz	48 ppm			
50 kHz to 100 kHz	86 ppm			
100 kHz to 300 kHz	230 ppm			
300 kHz to 500 kHz	560 ppm			
500 kHz to 1 MHz	0.19%			
20 V to 70 V				
10 Hz to 20 Hz	140 ppm			
20 Hz to 40 Hz	65 ppm			
40 Hz to 20 kHz	54 ppm			
20 kHz to 50 kHz	58 ppm			
50 kHz to 100 kHz	120 ppm			
100 kHz to 300 kHz	240 ppm			
300 kHz to 500 kHz	640 ppm			
500 kHz to 1 MHz	0.19%			



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
AC VOLTAGE (continued) Measurement	70 V to 220 V			Portchester
	10 Hz to 20 Hz	150 ppm		
	20 Hz to 40 Hz	65 ppm		
	40 Hz to 20 kHz	54 ppm		
	20 kHz to 50 kHz	70 ppm		
	50 kHz to 100 kHz	120 ppm		
	200 V to 700 V			
	10 Hz to 20 Hz	150 ppm		
	20 Hz to 40 Hz	91 ppm		
	40 Hz to 20 kHz	52 ppm		
	20 kHz to 50 kHz	190 ppm		
	50 kHz to 100 kHz	0.13%		
	700 V to 1000 V			
	10 Hz to 20 Hz	150 ppm		
	20 Hz to 40 Hz	91 ppm		
	40 Hz to 20 kHz	59 ppm		
	20 kHz to 50 kHz	190 ppm		
	50 kHz to 100 kHz	0.13%		
	1 kV to 8 kV			
	50 Hz	0.5%		
Specific values (measurement)	60 mV			
	10 Hz	150 ppm		
	20 Hz	85 ppm		
	40 Hz, 500 Hz, 1 kHz, 10kHz and			
	20 kHz	76 ppm		
	50 kHz	76 ppm		
	100 kHz	78 ppm		
	200 kHz	160 ppm		
	500 kHz	180 ppm		
	1 MHz	680 ppm		



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
AC VOLTAGE (continued) Specific values (measurement)	100 mV and 200 mV			Portchester
	10 Hz	120 ppm		
	20 Hz	63 ppm		
	40 Hz, 500 Hz, 1 kHz, 10kHz and 20 kHz	41 ppm		
	50 kHz	38 ppm		
	100 kHz	50 ppm		
	200 kHz	140 ppm		
	500 kHz	140 ppm		
	1 MHz	690 ppm		
	600 mV			
	10 Hz	120 ppm		
	20 Hz	52 ppm		
	40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz	29 ppm		
	50 kHz	30 ppm		
	100 kHz	42 ppm		
	200 kHz	140 ppm		
	500 kHz	160 ppm		
	1 MHz	690 ppm		
	1 V and 2 V			
	10 Hz	120 ppm		
	20 Hz	43 ppm		
	40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz	18 ppm		
	50 kHz	27 ppm		
	100 kHz	33 ppm		
	200 kHz	120 ppm		
	500 kHz	170 ppm		
	1 MHz	800 ppm		
	6 V			
	10 Hz	120 ppm		
	20 Hz	44 ppm		
	40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz	18 ppm		
	50 kHz	25 ppm		
	100 kHz	35 ppm		
	200 kHz	83 ppm		
	500 kHz	200 ppm		
	1 MHz	780 ppm		



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AC VOLTAGE (continued) Specific values (measurement)	10 V and 20 V  10 Hz 20 Hz 40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz 200 kHz 500 kHz 1 MHz  60 V  10 Hz 20 Hz 40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz 200 kHz 500 kHz 1 MHz  100 V and 200 V  10 Hz 20 Hz 40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz 200 kHz 500 kHz  600 V  10 Hz 20 Hz 40 Hz, 500 Hz, 1 kHz, 10kHz and 20 kHz 50 kHz 100 kHz	120 ppm 44 ppm  21 ppm 26 ppm 33 ppm 83 ppm 200 ppm 780 ppm     120 ppm 46 ppm  37 ppm 36 ppm 69 ppm 110 ppm 300 ppm 790 ppm     130 ppm 46 ppm  37 ppm 42 ppm 65 ppm 120 ppm 470 ppm     130 ppm 78 ppm  37 ppm 88 ppm 820 ppm		Portchester



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AC VOLTAGE (continued)				Portchester
Specific values (measurement)	1000 V			
	10 Hz	130 ppm		
	20 Hz	78 ppm		
	40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz	48 ppm		
	50 kHz	91 ppm		
	100 kHz	820 ppm		
AC CURRENT				
Generation	10 Hz to 1 kHz			
	10 $\mu$ A to 100 $\mu$ A	0.03% + 15 nA		
	100 $\mu$ A to 1 mA	0.025% + 120 nA		
	1 mA to 10 mA	0.020% + 1.2 $\mu$ A		
	10 mA to 100 mA	0.015% + 12 $\mu$ A		
	100 mA to 1 A	0.040% + 120 $\mu$ A		
	1 A to 10 A	0.060% + 1.5 mA		
	1 kHz to 5 kHz			
	10 $\mu$ A to 100 $\mu$ A	0.040% + 30 nA		
	100 $\mu$ A to 1 mA	0.025% + 120 nA		
	1 mA to 10 mA	0.025% + 1.2 $\mu$ A		
	10 mA to 100 mA	0.025% + 12 $\mu$ A		
	100 mA to 1 A	0.055% + 160 $\mu$ A		
	1 A to 10 A	0.11% + 1.9 mA		
	5 kHz to 10 kHz			
	1 A to 10 A	0.26% + 7.0 mA		
	10 kHz to 20 kHz			
	1 A to 10 A	0.85% + 20 mA		
Measurement	45 Hz to 100 Hz			
	Up to 100 $\mu$ A	0.070% + 25 nA		
	100 $\mu$ A to 1 mA	0.070% + 0.30 $\mu$ A		
	1 mA to 5 mA	0.070% + 2.5 $\mu$ A		



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AC CURRENT (continued)				Portchester
Measurement	100 Hz to 1 kHz			
	Up to 100 $\mu$ A	0.070% + 35 nA		
	100 $\mu$ A to 1 mA	0.030% + 0.30 $\mu$ A		
	100 Hz to 5 kHz			
	Up to 1 mA	0.030% + 0.30 $\mu$ A		
	1 mA to 5 mA	0.030% + 3 $\mu$ A		
	40 Hz to 10 kHz			
	5 mA to 20 A	0.020%		
INDUCTANCE				
Specific Values				
Generation	1 kHz			
	1 $\mu$ H	1.2 nH		
	3 $\mu$ H	3.6 nH		
	5 $\mu$ H	4.2 nH		
	10 $\mu$ H	8.0 nH		
	30 $\mu$ H	3.8 nH		
	100 $\mu$ H	12 nH		
	300 $\mu$ H	28 nH		
	1 mH	80 nH		
	3 mH	27 nH		
	10 mH	0.70 $\mu$ H		
	30 mH	3.4 $\mu$ H		
	100 mH	8.4 $\mu$ H		
	400 mH	30 $\mu$ H		
	1 H	85 $\mu$ H		



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INDUCTANCE (continued)				Porchester
Specific Values				
Measurement	1 kHz			
	1 $\mu$ H	3.0 nH		
	3 $\mu$ H	5.0 nH		
	5 $\mu$ H	6.0 nH		
	10 $\mu$ H	9.0 nH		
	30 $\mu$ H	0.014%		
	100 $\mu$ H	0.014%		
	300 $\mu$ H	0.010%		
	1 mH	0.010%		
	3 mH	0.010%		
	10 mH	0.010%		
	30 mH	0.014%		
	100 mH	0.010%		
	400 mH	0.010%		
	1 H	0.010%		
Other Values				
Measurement	1 kHz			
	1 $\mu$ H to 10 $\mu$ H	0.30%		
	10 $\mu$ H to 100 $\mu$ H	0.10%		
	100 $\mu$ H to 1 mH	0.020%		
	1 mH to 10 mH	0.015%		
	10 mH to 100 mH	0.015%		
	100 mH to 1 H	0.015%		
	1 H to 10 H	0.12%		
CAPACITANCE				
Specific Values				
Generation	1 kHz			
	10 pF	4.0 ppm		
	100 pF	4.0 ppm		
	1 nF	4.0 ppm		
	10 nF	41 ppm		
	100 nF	41 ppm		
	1 $\mu$ F	63 ppm		
	100 $\mu$ F	0.050%		



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<b>CAPACITANCE (continued)</b>				<b>Portchester</b>
Measurement	1 kHz			
	10 pF	8.0 ppm		
	100 pF	7.0 ppm		
	1 nF	7.0 ppm		
	10 nF	41 ppm		
	100 nF	41 ppm		
	1 $\mu$ F	63 ppm		
	100 $\mu$ F	0.050%		
Other Values	1 kHz and 1592 Hz			
	1 pF to 10 $\mu$ F	0.010%		
	10 $\mu$ F to 100 $\mu$ F	0.050%		
<b>FREQUENCY</b>				
Specific Values	1 MHz, and 10 MHz	2.6 in $10^{12}$		
Other Values	Up to 0.001 Hz 0.001 Hz to 0.01 Hz 0.01 Hz to 10 Hz 10 Hz to 100 MHz 100 MHz to 18 GHz	12 in $10^6 + 1$ count 12 in $10^7 + 1$ count 12 in $10^8 + 1$ count 12 in $10^9 + 1$ count 4 in $10^9 + 1$ count		
<b>TIME INTERVAL</b>				
	1 $\mu$ s to 10 ms 10 ms to 100 ms 0.1 s to 1 s 1 to 10 s 10 s to 100 s 100 s to 1000 s 1000 s to 10 000 s 0 000 s to 100 000 s	10 ns 30 ns 200 ns 2.0 $\mu$ s 20 $\mu$ s 200 $\mu$ s 2.0ms 20 ms	Time interval averaging	
<b>RISE and FALL TIME (pulse waveforms)</b>	up to 200 ns 200 ns to 20 $\mu$ s > 20 $\mu$ s	5.5% + 470 ps 5.5% 3%		



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RF BANDWIDTH (oscilloscope calibration)	For input voltages in the range 10 mV p-p to 5 V p-p		Expressed in terms of the frequency at which the -3dB point is obtained, with respect to a low frequency reference point	Porchester
	<i>Up to 250 MHz</i>	2.5%	<input type="checkbox"/> For input VSWR not exceeding 1.3:1  <input type="checkbox"/> For input VSWR not exceeding 2.5:1  <i>The uncertainties will be increased for values of VSWR greater than those shown</i>	
	<i>250 MHz to 550 MHz</i>	2.6%		
	<i>50 kHz to 550 MHz</i>	6.0%		
Electrical calibration of temperature indicators and simulators				
Base metal thermocouples	-250 °C to -200 °C -200 °C to 0 °C 0 °C to 1000 °C 1000 °C to 1370 °C	1.0 °C 0.20 °C 0.10 °C 0.12 °C	<input type="checkbox"/> Excluding cold junction compensation	
	-250 °C to -200 °C -200 °C to 0 °C 0 °C to 1000 °C 1000 °C to 1370 °C	1.0 °C 0.30 °C 0.24 °C 0.26 °C	<input type="checkbox"/> Including cold junction compensation	
Noble metal thermocouples	0 °C to 40 °C 40 °C to 250 °C 250 °C to 1760 °C	0.80 °C 0.50 °C 0.32 °C	<input type="checkbox"/> Excluding cold junction compensation	
	0 °C to 40 °C 40 °C to 1760 °C	1.3 °C 1.1 °C	<input type="checkbox"/> Including cold junction compensation	
Resistance sensors	-200 °C to 0 °C 0 °C to 750 °C 750 °C to 850 °C	0.010 °C 0.040 °C 0.050 °C		



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
<u>RELATIVE HUMIDITY and DEW POINT</u>				<b>Portchester</b>
<u>Dew point</u>	-20 °C to 80 °C	0.20 °C	Results can be reported in other humidity units	
<u>Relative humidity instruments including psychrometers</u>	10 °C to 50 °C 5 %rh to 65 %rh 65 %rh to 98 %rh	2 %rh 3% of reading		
	50 °C to 85 °C 5 %rh to 70 %rh 70 %rh to 98 %rh	2.5 %rh 3.5% of reading		
Saturated salt capsules	At 20 °C 5 %rh to 65 %rh 65 %rh to 98 %rh	2.1 %rh 3% of reading + 0.28 %rh		
<u>TEMPERATURE</u>				
Resistance thermometers	Triple point of water (0.01 °C) Ice point (0.00 °C) -70 °C to 250 °C 250 °C to 450 °C 450 °C to 650 °C	0.0030 °C 0.0050 °C 0.010 °C 0.030 °C 0.055 °C		
Platinum thermocouples	0 °C to 600 °C 600 °C to 1100 °C 1100 °C to 1200 °C	1.0 °C 2.0 °C 2.3 °C		
Other thermocouples	-70 °C to 600 °C 600 °C to 1100 °C 1100 °C to 1200 °C	0.20 °C 2.0 °C 2.3 °C		
Block calibrators	-50 °C to 250 °C 250 °C to 600 °C 250 °C to 1100 °C	0.090 °C 0.15 °C 1.2 °C	using PRT sensors using PRT sensors using thermocouples	
Calibrations in air chamber	-40 °C to 5 °C 5 °C to 100 °C	0.32 °C 0.22 °C		
Electronic thermometers with sensors	Ranges as for above sensors	as for sensor		
<u>PRESSURE</u>			Including calibration of pressure measuring devices with an electrical output	
Gas pressure (absolute)				
Calibration of pressure indicating instruments and gauges	800 kPa to 1150 kPa	25 Pa		



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Gas pressure (gauge)  Calibration of pressure indicating instruments and gauges	-100 kPa to -10 kPa -10 kPa to -3.5 kPa -3.5 kPa to -1.5 kPa  1.5 kPa to 3.5 kPa 3.5 kPa to 2.5 MPa 2.5 MPa to 6 MPa 6 MPa to 25 MPa	0.010% 0.020% 0.020% + 1.5 Pa  0.020% + 1.5 Pa 0.0080% 0.050% + 2.7 kPa 0.050% + 13 kPa	Absolute pressure calibrations may be undertaken by associated barometric pressure measurement with an additional uncertainty of $\pm 25$ Pa	Portchester
Hydraulic pressure (gauge)  Calibration of pressure indicating instruments and gauges	0 to 600 kPa 600 kPa to 6 MPa 6 MPa to 70 MPa	0.050% + 810 Pa 0.010% 0.010%		
<u>RELATIVE HUMIDITY</u>  Humidity controlled chambers (including associated indicators, controllers and recorders)	10 °C to 50 °C 5 %rh to 98 %rh  50 °C to 85 °C 5 %rh to 98 %rh	3.0 %rh  3.6 %rh	There may be an additional uncertainty due to the performance of the chamber being calibrated	Site Calibration
<u>TEMPERATURE</u>  Temperature controlled chambers, autoclaves, fridges, freezers, ovens and furnaces (including associated indicators, controllers and recorders)	-70 °C to -40 °C -40 °C to 150 °C 150 °C to 250 °C 250 °C to 375 °C 375 °C to 600 °C 600 °C to 1100 °C	1.0 °C 0.13 °C 1.0 °C 2.1 °C 5.2 °C 5.6 °C		
Temperature indicators with probes	-20 °C to 140 °C  140 °C to 600 °C	0.15 °C + indicator resolution 0.21 °C + indicator resolution		
TIME  Timers and time interval	up to 24 hours	1 s		



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<b>ELECTRICAL</b>				
<b>TEMPERATURE SIMULATION</b>				
Calibration of temperature indicators for the following sensor types				
Base metal thermocouple	-250 °C to -200 °C	1.5 °C	] Excluding cold junction compensation	<b>Site Calibration</b>
	-200 °C to 0 °C	0.29 °C		
	0 °C to 1000 °C	0.12 °C		
	1000 °C to 1370 °C	0.17 °C		
Noble metal thermocouple	-250 °C to -200 °C	1.5 °C	] Including cold junction compensation	
	-200 °C to 0 °C	0.40 °C		
	0 °C to 1370 °C	0.30 °C		
Resistance sensors	0 °C to 40 °C	1.2 °C	] Excluding cold junction compensation	
	40 °C to 250 °C	0.70 °C		
	250 °C to 1760 °C	0.47 °C		
DC VOLTAGE	0 °C to 40 °C	1.5 °C	] Including cold junction compensation	
	40 °C to 250 °C	1.2 °C		
	250 °C to 1760 °C	1.1 °C		
Generation	-200 °C to 0 °C	0.040 °C		
	0 °C to 750 °C	0.35 °C		
	750 °C to 850 °C	0.40 °C		
	Up to 10 mV	0.027% + 3.9 μV		
	10 mV to 0.1 V	0.018% + 8.5 μV		
	0.1 V to 1 V	0.010% + 14 μV		
Measurement	1 V to 10 V	0.012% + 120 μV		
	10 V to 100 V	0.023% + 6.0 mV		
	100 V to 1000 V	0.035% + 58 mV		
	Up to 100 mV	0.030% + 6.0 μV		
	100 mV to 1 V	0.005% + 9.0 μV		
	1 V to 10 V	0.004% + 60 μV		
	10 V to 100 V	0.006% + 0.70 mV		
	100 V to 1000 V	0.006% + 2.0 mV		
	1 kV to 2 kV	0.060% + 0.60 V		
	2 kV to 20 kV	0.080% + 6.0 V		



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
DC RESISTANCE				Site Calibration
Generation	10 mΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ	130 ppm + 0.30 mΩ 0.070% + 45 mΩ 0.070% + 2.5 Ω 0.070% + 120 Ω 0.090% + 1.5 kΩ		
Measurement	10 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ	0.012% + 5.4 mΩ 0.012% + 2.9 mΩ 0.012% + 0.13 Ω 0.012% + 1.3 Ω 0.013% + 17 Ω 0.050% + 0.26 kΩ 1.3% + 12 kΩ		
DC CURRENT				
Generation	Up 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 10 A	0.029% + 6.4 nA 0.019% + 8.1 nA 0.012% + 0.27 μA 0.013% + 2.4 μA 0.035% + 63 μA 0.071% + 2.3 mA		
Measurement	Up to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.06% + 2.5 μA 0.06% + 6.0 μA 0.12% + 0.2 mA 0.15% + 1.0 mA		
AC VOLTAGE				
Generation	1 mV to 10 mV  40 Hz to 400 Hz 400 Hz to 800 Hz 800 Hz to 3.2 kHz 3.2 kHz to 6.4 kHz 6.4 kHz to 12.8 kHz  10 mV to 100 mV  40 Hz to 400 Hz 400 Hz to 800 Hz 800 Hz to 1.6 kHz 1.6 kHz to 3.2 kHz 3.2 kHz to 6.4 kHz 6.4 kHz to 12.8 kHz	  0.17% + 6.0 μV 0.33% + 12 μV 0.47% + 12 μV 1.2% + 23 μV 2.9% + 60 μV    0.12% + 60 μV 0.33% + 120 μV 0.49% + 120 μV 0.47% + 120 μV 1.2% + 230 μV 2.9% + 580 μV		



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Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty ( $k=2$ )	Remarks	Location Code
AC VOLTAGE (continued)				<b>Site Calibration</b>
Generation	100 mV to 1 V			
	<i>40 Hz to 400 Hz</i>	0.090% + 87 $\mu$ V		
	<i>400 Hz to 800 Hz</i>	0.17% + 140 $\mu$ V		
	<i>800 Hz to 1.6 kHz</i>	0.33% + 240 $\mu$ V		
	<i>1.6 kHz to 3.2 kHz</i>	0.47% + 470 $\mu$ V		
	<i>3.2 kHz to 6.4 kHz</i>	1.2% + 1.2 mV		
	<i>6.4 kHz to 12.8 kHz</i>	2.9% + 2.3 mV		
	1 V to 10 V			
	<i>40 Hz to 400 Hz</i>	0.090% + 0.90 mV		
	<i>400 Hz to 800 Hz</i>	0.17% + 1.2 mV		
	<i>800 Hz to 1.6 kHz</i>	0.33% + 2.4 mV		
	<i>1.6 kHz to 3.2 kHz</i>	0.47% + 5.0 mV		
	<i>3.2 kHz to 6.4 kHz</i>	1.2% + 12 mV		
	<i>6.4 kHz to 12.8 kHz</i>	2.9% + 35 mV		
	10 V to 100 V			
	<i>40 Hz to 400 Hz</i>	0.14% + 14 mV		
	100 V to 1000 V			
	<i>40 Hz to 400 Hz</i>	0.19% + 0.59 V		
Measurement	10 mV to 100 mV			
	<i>32 Hz to 330 Hz</i>	0.12% + 25 $\mu$ V		
	<i>330 Hz to 10 kHz</i>	0.19% + 25 $\mu$ V		
	100 mV to 1 V			
	<i>32 Hz to 330 Hz</i>	0.080% + 0.18 mV		
	<i>330 Hz to 10 kHz</i>	0.080% + 0.18 mV		
	1 V to 10 V			
	<i>32 Hz to 330 Hz</i>	0.080% + 5.0 mV		
	<i>330 Hz to 10 kHz</i>	0.080% + 5.0 mV		



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AC VOLTAGE (continued)				<b>Site Calibration</b>
Measurement	10 V to 100 V			
	32 Hz to 330 Hz	0.080% + 50 mV		
	330 Hz to 10 kHz	0.080% + 50 mV		
	100 V to 750 V			
	32 Hz to 330 Hz	0.080% + 0.50 V		
	330 Hz to 10 kHz	0.080% + 0.50V		
	50 Hz			
	750 V to 2 kV	0.51% + 3.0 V		
	2 kV to 8 kV	0.68% + 50 V		
AC CURRENT				<b>Site Calibration</b>
Generation	10 $\mu$ A to 100 $\mu$ A			
	45 Hz to 100 Hz	0.22% + 85 nA		
	100 Hz to 400 Hz	0.12% + 90 nA		
	400 Hz to 800 Hz	0.34% + 150 nA		
	100 $\mu$ A to 1 mA			
	45 Hz to 100 Hz	0.11% + 0.51 $\mu$ A		
	100 Hz to 400 Hz	0.090% + 0.70 $\mu$ A		
	400 Hz to 800 Hz	0.12% + 0.40 $\mu$ A		
	800 Hz to 1.6 kHz	0.24% + 0.42 $\mu$ A		
	1.6 kHz to 3.2 kHz	0.47% + 0.60 $\mu$ A		
	1 mA to 10 mA			
	45 Hz to 100 Hz	0.10% + 2.6 $\mu$ A		
	100 Hz to 400 Hz	0.070% + 3.1 $\mu$ A		
	400 Hz to 800 Hz	0.12% + 3.2 $\mu$ A		
	800 Hz to 1.6 kHz	0.23% + 3.8 $\mu$ A		
	1.6 kHz to 3.2 kHz	0.58% + 5.5 $\mu$ A		
	3.4 kHz to 6.4 kHz	2.3% + 12 $\mu$ A		



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AC CURRENT (continued)				<b>Site Calibration</b>
Generation	10 mA to 100 mA			
	45 Hz to 100 Hz	0.10% + 26 $\mu$ A		
	100 Hz to 400 Hz	0.070% + 29 $\mu$ A		
	400 Hz to 800 Hz	0.12% + 30.3 $\mu$ A		
	800 Hz to 1.6 kHz	0.23% + 36.3 $\mu$ A		
	1.6 kHz to 3.2 kHz	0.58% + 54 $\mu$ A		
	3.4 kHz to 6.4 kHz	2.3% + 120 $\mu$ A		
	100 mA to 1 A			
	45 Hz to 100 Hz	0.13% + 0.30 mA		
	100 Hz to 400 Hz	0.15% + 0.30 mA		
	400 Hz to 800 Hz	0.17% + 0.40 mA		
	800 Hz to 1.6 kHz	0.26% + 0.50 mA		
	1.6 kHz to 3.2 kHz	0.60% + 0.70 mA		
	3.4 kHz to 6.4 kHz	2.3% + 1.2 mA		
	1 A to 10 A			
	10 Hz to 400 Hz	0.14% + 10 mA		
	400 Hz to 800 Hz	0.24% + 12 mA		
	800 Hz to 1.6 kHz	0.36% + 12 mA		
Measurement	0.1 A to 1 A			
	10 Hz to 1 kHz	0.15% + 0.60 mA		
	1 A to 3 A			
	10 Hz to 1 kHz	0.20% + 2.8 mA		
	3 A to 30 A			
	50 Hz	0.22% + 71 mA		
	30 A to 75 A			
	50 Hz	0.23% + 140 mA		
	75 A to 150 A			
	50 Hz	0.23% + 280 mA		
END				