


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>UKAS CALIBRATION 0078</p> <p>Accredited to ISO/IEC 17025:2005</p>	<h3>Absolute Calibration Limited</h3> <p>Issue No: 042 Issue date: 10 April 2012</p>	
	<p>14 Murrills Estate Portchester Hampshire PO16 9RD</p>	<p>Contact: Mr M R Funnell Tel: +44 (0)2392 321712 Fax: +44 (0)2392 210034 E-Mail: calit@absolute-cal.co.uk Website: www.absolute-cal.co.uk</p>
<p>Calibration performed by the Organisations at the locations specified below</p>		

Locations covered by the organisation and their relevant activities

Laboratory location:

Location details	Activity	Location code
<p>Address</p> <p>14 Murrills Estate Portchester Hampshire PO16 9RD</p> <p>Contact Mr M R Funnell 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>	Portchester

Site activities performed away from the location listed above:

Location details	Activity	Location code
<p>Customers' sites or premises</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>Contact Mr M R Funnell 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>	Site Calibration



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DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty ($k = 2$)	Remarks	Location Code
<u>ELECTRICAL CALIBRATION</u>				
DC RESISTANCE Measurement, <i>Specific Values</i>	100 $\mu\Omega$ 1.0 m Ω 10 m Ω 100 m Ω 1.0 Ω 10 Ω 100 Ω 1.0 k Ω 10 k Ω 100 k Ω 1.0 M Ω 10 M Ω 100 M Ω 1.0 G Ω	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 CMC 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
Measurement, <i>Other values</i>	80 m Ω to 800 m Ω 0.80 Ω to 107.5 Ω 107.5 Ω to 1.34 k Ω 1.34k Ω to 10.75 k Ω 10.75 k Ω to 12 k Ω 12 k Ω to 63 k Ω 63 k Ω to 134 k Ω 134 k Ω to 1.075 M Ω 1.075 M Ω to 13.4 M Ω 13.4 M Ω to 630 M Ω 630 M Ω to 1.075 G Ω 1.075 G Ω to 2.0 G Ω 2.0 G Ω to 20 G Ω 20 G Ω to 200 G Ω 200 G Ω to 2.0 T Ω	0.25 ppm 0.090 ppm 0.080 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 Ω , 300 M Ω , 1.0 G Ω 3.0 G Ω 10 G Ω	0.30 % 0.45 % 0.35 %	Applied Voltage 10 V	
	30 G Ω , 100 G Ω , 300 G Ω 1.0 T Ω 3.0 T Ω	0.35 % 0.70 % 0.75 %	Applied Voltage 100 V	
	100 M Ω , 300 M Ω , 1.0 G Ω 3.0 G Ω 10 G Ω , 30 G Ω , 100 G Ω , 300 G Ω	0.30 % 0.45 % 0.35 %	Applied Voltage 500 V	
	1.0 T Ω 3.0 T Ω	0.70 % 0.75 %	Applied Voltage 500 V	



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AC RESISTANCE				Portchester
Generation	40 Hz to 1592 Hz			
	0.10 Ω	0.030 %	Measurement of suitable resistors of the same nominal values may also be undertaken but the uncertainties may be increased.	
	1.0 Ω	10 ppm		
	10 Ω	6.0 ppm		
	100 Ω	8.0 ppm		
	1.0 k Ω	7.0 ppm		
	10 k Ω	6.0 ppm		
DC VOLTAGE				
Standard Cell Values	1.018 V	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	1.018 V	0.44 ppm		
	10 V	0.23 ppm		
Specific Values	0.10 V	0.61 ppm		
	1.0 V	0.43 ppm		
	10 V	0.34 ppm		
	100 V	0.40 ppm		
	1.0 kV	0.70 ppm		
Other Values	0 mV to 100 mV	2.5 μ V		
	100 mV to 1.0 V	0.45 μ V		
	1.0 V to 10 V	0.44 ppm		
	10 V to 100 V	0.50 ppm		
	100V to 1.0 kV	2.5 ppm		
	1.0 kV to 10 kV	0.030 %		
	10 kV to 50 kV	0.060 %		
DC VOLTAGE RATIO				
(for ratio component values up to 2 V)	0 to unity	5×10^{-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				
	1.0 pA to 10 pA	0.40 pA		
	100 pA to 100 pA	0.40 pA		
	100 pA to 1.0 nA	0.25 % + 0.4 pA		
	1.0 nA to 10 nA	0.25 %		
	10 nA to 1.0 μ A	0.15 %		
	1 μ A to 10 μ A	0.060 %		
	10 μ A to 1.0 A	50 ppm		
	1.0 A to 100 A	100 ppm		



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DC CURRENT (continued) Specific values for calibration of Wavetek 4950 Multifunction Transfer Standards	100 μ A 1.0 mA 10 mA 100 mA 1.0 A	5.9 ppm 5.7 ppm 5.7 ppm 5.7 ppm 11 ppm		Portchester
AC VOLTAGE Generation	10 Hz to 31 Hz			
	1.0 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			
	0 mV to 1.0 mV 1.0 mV to 10 mV 10 mV to 100 mV 100 mV to 1.0 V 1.0 V to 10 V 10 V to 100 V 100 V to 1000 V	0.23 % + 6.0 μ V 0.035 % + 6.5 μ V 0.014 % + 15 μ V 0.0065 % + 35 μ V 0.0063 % + 350 μ V 0.0075 % + 2.3 mV 0.017 % + 25 mV		
	330 Hz to 10 kHz			
	0 mV to 1.0 mV 1.0 mV to 10 mV 10 mV to 100 mV 100 mV to 1.0 V 1.0 V to 10 V 10 V to 100 V 100 V to 1000 V	0.23 % + 6.0 μ V 0.035 % + 6.2 μ V 0.015 % + 15 μ V 0.0055 % + 35 μ V 0.0053 % + 350 μ V 0.0065 % + 1.3 mV 0.012 % + 25 mV		
	10 kHz to 33 kHz			
	0 mV to 1.0 mV 1.0 mV to 10 mV 10 mV to 100 mV 100 mV to 1.0 V 1.0 V to 10 V 10 V to 100 V 100 V to 1000 V	0.25 % + 6.0 μ V 0.050 % + 6.5 μ V 0.025 % + 15 μ V 0.0055 % + 35 μ V 0.0053 % + 350 μ V 0.0065 % + 1.3 mV 0.012 % + 25 mV		



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AC VOLTAGE (continued) Generation	30 kHz to 100 kHz			Portchester
	0 mV to 1.0 mV	0.26 % + 6.0 μ V		
	1.0 mV to 10 mV	0.070 % + 6.5 μ V		
	10 mV to 100 mV	0.052 % + 15 μ V		
	100 mV to 1.0 V	0.011 % + 35 μ V		
	1.0 V to 10 V	0.011 % + 350 μ 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			
	0 mV to 1.0 mV	0.30 % + 6.0 μ V		
	1.0 mV to 10 mV	0.080 % + 7.0 μ V		
	10 mV to 100 mV	0.065 % + 200 μ V		
	100 mV to 1.0 V	0.035 % + 35 μ V		
	1.0 V to 10 V	0.031 % + 350 μ V		
	300 kHz to 1 MHz			
	1.0 V to 10 V	0.18 % + 5.0 mV		
Measurement	70 mV to 220 mV			
	10 Hz to 20 Hz	140 ppm + 1.7 μ V		
	20 Hz to 40 Hz	74 ppm + 1.7 μ V		
	40 Hz to 20 kHz	54 ppm + 1.7 μ V		
	20 kHz to 50 kHz	54 ppm + 2.3 μ V		
	50 kHz to 100 kHz	84 ppm + 2.9 μ V		
	100 kHz to 300 kHz	240 ppm + 4.6 μ V		
	300 kHz to 500 kHz	380 ppm + 9.2 μ V		
	500 kHz to 1 MHz	0.16 % + 9.2 μ V		
	200 mV to 700 mV			
	10 Hz to 20 Hz	140 ppm + 1.7 μ V		
	20 Hz to 40 Hz	65 ppm + 1.7 μ V		
	40 Hz to 20 kHz	46 ppm + 1.7 μ V		
	20 kHz to 50 kHz	48 ppm + 2.3 μ V		
	50 kHz to 100 kHz	80 ppm + 2.9 μ V		
	100 kHz to 300 kHz	240 ppm + 4.6 μ V		
	300 kHz to 500 kHz	390 ppm + 9.2 μ V		
	500 kHz to 1 MHz	0.16 % + 9.0 μ V		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty ($k = 2$)	Remarks	Location Code
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 1.0 MHz	0.16 %		
	2.0 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 1.0 MHz	0.19 %		
	7.0 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 1.0 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 1.0 MHz	0.19 %		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) 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 %		
	1.0 kV to 8.0 kV 50 Hz	0.50 %		
Specific values (measurement)	60 mV			
	10 Hz	150 ppm		
	20 Hz	85 ppm		
	40 Hz, 500 Hz, 1.0 kHz, 10 kHz 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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AC VOLTAGE (continued) Specific values (measurement)	100 mV and 200 mV 10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz 200 kHz 500 kHz 1 MHz 600 mV 10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz 200 kHz 500 kHz 1.0 MHz 1.0 V and 2.0 V 10 Hz 20 Hz 40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz 200 kHz 500 kHz 1.0 MHz	120 ppm 63 ppm 41 ppm 38 ppm 50 ppm 140 ppm 140 ppm 690 ppm 120 ppm 52 ppm 29 ppm 30 ppm 42 ppm 140 ppm 160 ppm 690 ppm 120 ppm 43 ppm 18 ppm 27 ppm 33 ppm 120 ppm 170 ppm 800 ppm		Portchester



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AC VOLTAGE (continued) Specific values (measurement)	6.0 V	120 ppm 44 ppm		Porchester
	10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz	18 ppm 25 ppm		
	50 kHz 100 kHz 200 kHz 500 kHz 1.0 MHz	35 ppm 83 ppm 200 ppm 780 ppm		
	10 V and 20 V			
	10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz	120 ppm 44 ppm 21 ppm 26 ppm		
	50 kHz 100 kHz 200 kHz 500 kHz 1.0 MHz	33 ppm 83 ppm 200 ppm 780 ppm		
	60 V			
	10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz	120 ppm 46 ppm 37 ppm 36 ppm		
	50 kHz 100 kHz 200 kHz 500 kHz 1.0 MHz	69 ppm 110 ppm 300 ppm 790 ppm		
	100 V and 200 V			
	10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz	130 ppm 46 ppm 37 ppm 42 ppm		
	50 kHz 100 kHz 200 kHz 500 kHz	65 ppm 120 ppm 470 ppm		



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AC VOLTAGE (continued) Specific values (measurement)	600 V	130 ppm 78 ppm		Portchester
	10 Hz 20 Hz 40 Hz, 500 Hz, 1.0 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz	37 ppm 88 ppm 820 ppm		
	1000 V	130 ppm 78 ppm		
	10 Hz 20 Hz 40 Hz, 500 Hz, 1 kHz, 10 kHz and 20 kHz 50 kHz 100 kHz	48 ppm 91 ppm 820 ppm		
AC CURRENT				
Generation	10 Hz to 1.0 kHz			
	10 µA to 100 µA 100 µA to 1.0 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1.0 A 1.0 A to 10 A	0.030 % + 15 nA 0.025 % + 120 nA 0.020 % + 1.2 µA 0.015 % + 12 µA 0.040 % + 120 µA 0.060 % + 1.5 mA		
	1.0 kHz to 5.0 kHz			
	10 µA to 100 µA 100 µA to 1.0 mA 1.0 mA to 10 mA 10 mA to 100 mA 100 mA to 1.0 A 1.0 A to 10 A	0.040 % + 30 nA 0.025 % + 120 nA 0.025 % + 1.2 µA 0.025 % + 12 µA 0.055 % + 160 µA 0.11 % + 1.9 mA		
	5.0 kHz to 10 kHz			
	1.0 A to 10 A	0.26 % + 7.0 mA		
	10 kHz to 20 kHz			
	1.0 A to 10 A	0.85 % + 20 mA		



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AC CURRENT (continued) Measurement	45 Hz to 100 Hz			Portchester
	0 μ A to 100 μ A	0.070 % + 25 nA		
	100 μ A to 1.0 mA	0.070 % + 0.30 μ A		
	1.0 mA to 5.0 mA	0.070 % + 2.5 μ A		
	100 Hz to 1 kHz			
	0 μ A to 100 μ A	0.070 % + 35 nA		
	100 μ A to 1.0 mA	0.030 % + 0.30 μ A		
	100 Hz to 5 kHz			
	0 mA to 1 mA	0.030 % + 0.30 μ A		
	1 mA to 5 mA	0.030 % + 3.0 μ A		
	40 Hz to 10 kHz			
	5 mA to 20 A	0.020 %		
INDUCTANCE				
Specific Values				
Generation	1.0 kHz			
	1.0 μ H	1.2 nH		
	3.0 μ H	3.6 nH		
	5.0 μ H	4.2 nH		
	10 μ H	8.0 nH		
	30 μ H	3.8 nH		
	100 μ H	12 nH		
	300 μ H	28 nH		
	1.0 mH	80 nH		
	3.0 mH	27 nH		
	10 mH	0.70 μ H		
	30 mH	3.4 μ H		
	100 mH	8.4 μ H		
	400 mH	30 μ H		
	1.0 H	85 μ H		



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INDUCTANCE (continued)				Portchester
Specific Values				
Measurement	1.0 kHz			
	1.0 μ H	3.0 nH		
	3.0 μ H	5.0 nH		
	5.0 μ H	6.0 nH		
	10 μ H	9.0 nH		
	30 μ H	0.014 %		
	100 μ H	0.014 %		
	300 μ H	0.010 %		
	1.0 mH	0.010 %		
	3.0 mH	0.010 %		
	10 mH	0.010 %		
	30 mH	0.014 %		
	100 mH	0.010 %		
	400 mH	0.010 %		
	1.0 H	0.010 %		
Other Values				
Measurement	1.0 kHz			
	1.0 μ H to 10 μ H	0.30 %		
	10 μ H to 100 μ H	0.10 %		
	100 μ H to 1.0 mH	0.020 %		
	1.0 mH to 10 mH	0.015 %		
	10 mH to 100 mH	0.015 %		
	100 mH to 1.0 H	0.015 %		
	1.0 H to 10 H	0.12 %		
CAPACITANCE				
Specific Values				
Generation	1.0 kHz			
	10 pF	4.0 ppm		
	100 pF	4.0 ppm		
	1.0 nF	4.0 ppm		
	10 nF	41 ppm		
	100 nF	41 ppm		
	1.0 μ F	63 ppm		
	100 μ F	0.050 %		



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CAPACITANCE (continued)				Portchester
Measurement	1.0 kHz			
	10 pF	8.0 ppm		
	100 pF	7.0 ppm		
	1.0 nF	7.0 ppm		
	10 nF	41 ppm		
	100 nF	41 ppm		
	1.0 μ F	63 ppm		
	100 μ F	0.050 %		
Other Values	1.0 kHz and 1592 Hz			
	1.0 pF to 10 μ F	0.010 %		
	10 μ F to 100 μ F	0.050 %		
FREQUENCY				
Specific Values	1.0 MHz and 10 MHz	$2.6 \text{ in } 10^{12}$		
Other Values	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 $10^7 + 1$ count 12 in $10^8 + 1$ count 12 in $10^9 + 1$ count 4.0 in $10^9 + 1$ count		
TIME INTERVAL				
	1.0 μ s to 10 ms 10 ms to 100 ms 0.10 s to 1.0 s 1.0 to 10 s 10 s to 100 s 100 s to 1000 s 1000 s to 10 000 s 10 000 s to 100 000 s	10 ns 30 ns 200 ns 2.0 μ s 20 μ s 200 μ s 2.0 ms 20 ms	Time interval averaging	
RISE and FALL TIME (pulse waveforms)	0 ns to 200 ns 200 ns to 20 μ s > 20 μ s	5.5 % + 470 ps 5.5 % 3.0 %		



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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
	50 kHz to 250 MHz	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>	
	250 MHz to 550 MHz	2.6 %		
	50 kHz to 550 MHz	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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<u>RELATIVE HUMIDITY and DEW POINT</u>				Portchester
<u>Dew point</u>	- 20 °C to + 80 °C	0.20 °C	Results can reported in other humidity units	
<u>Relative humidity instruments including psychrometers</u>	10 °C to 50 °C	2.0 %rh 3.0 % of reading		
	5.0 %rh to 65 %rh			
	65 %rh to 98 %rh			
Saturated salt capsules	50 °C to 85 °C	2.5 %rh 3.5 % of reading		
	5.0 %rh to 70 %rh			
	70 %rh to 98 %rh			
	At 20 °C	2.1 %rh 3.0 % of reading + 0.28 %rh		
	5.0 %rh to 65 %rh 65 %rh to 98 %rh			
<u>TEMPERATURE</u>				
Resistance thermometers	Triple point of water (0.01 °C)	0.0030 °C		
	Ice point (0.00 °C)	0.0050 °C		
	- 90 °C to - 70 °C	0.10 °C		
	- 70 °C to 250 °C	0.010 °C		
	250 °C to 450 °C	0.030 °C		
	450 °C to 650 °C	0.055 °C		
Platinum thermocouples	0 °C to 600 °C	1.0 °C		
	600 °C to 1100 °C	2.0 °C		
	1100 °C to 1200 °C	2.3 °C		
Other thermocouples	- 90 °C to 600 °C	0.20 °C		
	600 °C to 1100 °C	2.0 °C		
	1100 °C to 1200 °C	2.3 °C		
Block calibrators	- 90 °C to 250 °C	0.12 °C		using PRT sensors using PRT sensors using thermocouples using thermocouples
	250 °C to 600 °C	0.16 °C		
	250 °C to 600 °C	1.2 °C		
	600 °C to 1100 °C	2.1 °C		
Calibrations in air chamber	- 40 °C to 5.0 °C	0.32 °C		
	5.0 °C to 100 °C	0.22 °C		
Electronic thermometers with sensors	Ranges as for above sensors	as for sensor		



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Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty ($k = 2$)	Remarks	Location Code
ELECTRICAL				
TEMPERATURE SIMULATION				
Calibration of temperature indicators for the following sensor types				
Base metal thermocouple	- 250 °C to - 200 °C	1.5 °C	Excluding cold junction compensation	Site Calibration
	- 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		
	0 °C to 40 °C	1.5 °C		
DC VOLTAGE	40 °C to 250 °C	1.2 °C	Including cold junction compensation	
	250 °C to 1760 °C	1.1 °C		
	- 200 °C to 0 °C	0.040 °C		
	0 °C to 750 °C	0.35 °C		
Generation	750 °C to 850 °C	0.40 °C		
	0 mV 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		
	1 V to 10 V	0.012 % + 120 μV		
	10 V to 100 V	0.023 % + 6.0 mV		
Measurement	100 V to 1000 V	0.035 % + 58 mV		
	0 mV to 100 mV	0.030 % + 6.0 μV		
	100 mV to 1.0 V	0.0050 % + 9.0 μV		
	1.0 V to 10 V	0.0040 % + 60 μV		
	10 V to 100 V	0.0060 % + 0.70 mV		
	100 V to 1000 V	0.0060 % + 2.0 mV		
	1.0 kV to 2.0 kV	0.060 % + 0.60 V		
	2.0 kV to 20 kV	0.080 % + 6.0 V		



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DC RESISTANCE					
Generation	10 mΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1.0 MΩ 1.0 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		Site Calibration	
Measurement	10 Ω to 100 Ω 100 Ω to 1.0 kΩ 1.0 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1.0 MΩ 1.0 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 % + 1.30 Ω 0.013 % + 17 Ω 0.050 % + 0.26 kΩ 1.3 % + 12 kΩ			
DC CURRENT					
Generation	0 μA to 100 μA 100 μA to 1.0 mA 1.0 mA to 10 mA 10 mA to 100 mA 100 mA to 1.0 A 1.0 A to 10 A	0.029 % + 6.4 nA 0.019 % + 8.1 nA 0.012 % + 0.27 μA 0.013 % + 2.40 μA 0.035 % + 63 μA 0.071 % + 2.3 mA			
Measurement	0 mA to 10 mA 10 mA to 100 mA 100 mA to 1.0 A 1.0 A to 3.0 A	0.060 % + 2.5 μA 0.060 % + 6.0 μA 0.12 % + 0.20 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	 0.17 % + 6.0 μV 0.33 % + 12 μV 0.47 % + 12 μV 1.2 % + 23 μV 2.9 % + 60 μV			
	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	 0.12 % + 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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AC VOLTAGE (continued)				Site Calibration
Generation	100 mV to 1.0 V			
	40 Hz to 400 Hz	0.090 % + 87 μ V		
	400 Hz to 800 Hz	0.17 % + 140 μ V		
	800 Hz to 1.6 kHz	0.33 % + 240 μ V		
	1.6 kHz to 3.2 kHz	0.47 % + 470 μ V		
	3.2 kHz to 6.4 kHz	1.2 % + 1.2 mV		
	6.4 kHz to 12.8 kHz	2.9 % + 2.3 mV		
	1 V to 10 V			
	40 Hz to 400 Hz	0.090 % + 0.90 mV		
	400 Hz to 800 Hz	0.17 % + 1.2 mV		
	800 Hz to 1.6 kHz	0.33 % + 2.4 mV		
	1.6 kHz to 3.2 kHz	0.47 % + 5.0 mV		
	3.2 kHz to 6.4 kHz	1.2 % + 12 mV		
	6.4 kHz to 12.8 kHz	2.9 % + 35 mV		
	10 V to 100 V			
	40 Hz to 400 Hz	0.14 % + 14 mV		
	100 V to 1000 V			
	40 Hz to 400 Hz	0.19 % + 0.59 V		
Measurement	10 mV to 100 mV			
	32 Hz to 330 Hz	0.12 % + 25 μ V		
	330 Hz to 10 kHz	0.19 % + 25 μ V		
	100 mV to 1.0 V			
	32 Hz to 330 Hz	0.080 % + 0.18 mV		
	330 Hz to 10 kHz	0.080 % + 0.18 mV		
	1.0 V to 10 V			
	32 Hz to 330 Hz	0.080 % + 5.0 mV		
	330 Hz to 10 kHz	0.080 % + 5.0 mV		



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AC VOLTAGE (continued) Measurement	10 V to 100 V 32 Hz to 330 Hz 330 Hz to 10 kHz	0.080 % + 50 mV 0.080 % + 50 mV		Site Calibration
	100 V to 750 V 32 Hz to 330 Hz 330 Hz to 10 kHz	0.080 % + 0.50 V 0.080 % + 0.50V		
	50 Hz 750 V to 2.0 kV 2.0 kV to 8.0 kV	0.51 % + 3.00 V 0.68 % + 50 V		
AC CURRENT Generation	10 μ A to 100 μ A 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 800 Hz	0.22 % + 85 nA 0.12 % + 90 nA 0.34 % + 150 nA		
	100 μ A to 1.0 mA 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 800 Hz 800 Hz to 1.6 kHz 1.6 kHz to 3.2 kHz	0.11 % + 0.51 μ A 0.090 % + 0.70 μ A 0.12 % + 0.40 μ A 0.24 % + 0.42 μ A 0.47 % + 0.60 μ A		
	1.0 mA to 10 mA 45 Hz to 100 Hz 100 Hz to 400 Hz 400 Hz to 800 Hz 800 Hz to 1.6 kHz 1.6 kHz to 3.2 kHz 3.4 kHz to 6.4 kHz	0.10 % + 2.6 μ A 0.070 % + 3.1 μ A 0.12 % + 3.2 μ A 0.23 % + 3.8 μ A 0.58 % + 5.5 μ A 2.3 % + 12 μ A		



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AC CURRENT (continued)				Site Calibration
Generation	10 mA to 100 mA			
	45 Hz to 100 Hz	0.10 % + 26 μ A		
	100 Hz to 400 Hz	0.070% + 29 μ A		
	400 Hz to 800 Hz	0.12 % + 30 μ A		
	800 Hz to 1.6 kHz	0.23 % + 36 μ A		
	1.6 kHz to 3.2 kHz	0.58 % + 54 μ A		
	3.4 kHz to 6.4 kHz	2.3 % + 120 μ A		
	100 mA to 1.0 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		
	1.0 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 1.0 A			
	10 Hz to 1 kHz	0.15 % + 0.60 mA		
	1.0 A to 3.0 A			
	10 Hz to 1 kHz	0.20 % + 2.8 mA		
	3.0 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				