

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>UKAS CALIBRATION</p> <p>0361</p> <p>Accredited to ISO/IEC 17025:2005</p>	<h3>Pennine Instrument Services Limited</h3> <p>Issue No: 020 Issue date: 27 August 2009</p>	
	<p>82-86 Upper Allen Street Sheffield S3 7GW</p>	<p>Contact: Mr G E Bell Tel: +44 (0)114 273 0534 Fax: +44 (0)114 275 1818 E-Mail: calibration@pennineinstruments.co.uk Website: www.pennineinstruments.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			
Measurement	Up to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1100 V	7 ppm + 1.0 μ V 6 ppm 7 ppm 8 ppm 9 ppm	
Generation	Up to 330 mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V 330 V to 1020 V	14 ppm + 4 μ V 17 ppm 17 ppm 17 ppm 17 ppm	
AC VOLTAGE			
Measurement	1.0 Hz to 10 Hz 1 mV to 12 mV	0.052% + 2 μ V	
	10 Hz to 100 Hz 1 mV to 12 mV	0.023% + 2 μ V	
	100 Hz to 10 kHz 1 mV to 12 mV	0.037% + 2 μ V	
	10 kHz to 100 kHz 1 mV to 12 mV	0.056% + 2 μ V	
	100 kHz to 300 kHz 1 mV to 12 mV	0.063% + 2 μ V	
	1 Hz to 20 kHz 12 mV to 120 V 120 v to 700 V	0.01% 0.027%	
	10 Hz to 20 kHz 700 V to 1.100 V	0.03%	



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AC VOLTAGE (cont'd)			
Measurement (cont'd)	20 kHz to 50 kHz 12 mV to 120 V 120 V to 700 V	0.015% 0.032%	
	20 kHz to 30 kHz 700 V to 1100 V	0.09%	
	50 kHz to 100 kHz 12 mV to 1.2 V 1.2 v to 12 V 12 V to 120 V 120 v to 700 V	0.021% 0.033% 0.038% 0.050%	
	100 kHz to 300 kHz 12 mV to 12 V 12 V to 120 V	0.038% 0.049%	
	300 kHz to 1 MHz 12 mV to 12 V 12 v to 120 V	0.41% 0.46%	
	1 MHz to 2 MHz 12 mV to 12 V	0.46%	
Generation	10 Hz to 45 Hz 1 mV to 330 mV 330 mV to 33 V	140 ppm + 110 μ V 120 ppm	
	45 Hz to 10 kHz 1 mV to 330 mV 330 mV to 33 V 33 V to 330 V	120 ppm + 110 μ V 100 ppm 110 ppm	
	10 kHz to 20 kHz 1 mV to 330 mV 330 mV to 33 V 33 V to 330 V	180 ppm + 110 μ V 170 ppm 190 ppm	
	20 kHz to 50 kHz 1 mV to 330 mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V	230 ppm + 110 μ V 220 ppm 190 ppm 240 ppm	
	50 kHz to 100 kHz 1 mV to 330 mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V	430 ppm + 110 μ V 430 ppm 440 ppm 1.1%	
	100 kHz to 500 kHz 1 mV to 330 mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V	0.26% + 160 μ V 0.27% 440 ppm 1.1%	



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AC VOLTAGE (cont'd)			
Generation (cont'd)	330 V to 1020 V 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	130 ppm 250 ppm 530 ppm	
DC CURRENT			
Measurement	Up to 1.2 μ A 1.2 μ A to 12 μ A 12 μ A to 120 μ A 0.12 mA to 120 mA 0.12 A to 1.2 A 1.2 A to 2 A 2 A to 11 A	140 ppm + 0.5 nA 22 ppm + 0.5 nA 21 ppm 21 ppm 60 ppm 63 ppm 150 ppm	
Generation	Up to 330 μ A 0.33 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA 0.33 A to 1.1 A 1.1 A to 3 A 3 A to 11 A 11 A to 20.5 A 20.5 A to 1025 A	100 ppm + 36 nA 110 ppm 110 ppm 110 ppm 210 ppm 240 ppm 780 ppm 910 ppm 0.6%	For the calibration of clampmeters only
AC CURRENT			
Measurement	10 Hz to 1 kHz 2 μ A to 200 μ A 0.2 mA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 0.2 A to 2 A	0.03% + 2 nA 0.03% 0.027% 0.03% 0.04%	
	1 kHz to 5 kHz 2 μ A to 120 μ A	0.073% + 2 nA	
	1 kHz to 10 kHz 0.12 mA to 12 mA 12 mA to 120 mA 120 mA to 1.05 A	0.04 % 0.05 % 0.12%	
	1 kHz to 5 kHz 1.05 A to 2 A	0.16%	
	20 Hz to 2 kHz 2 A to 11 A	0.04%	
	2 kHz to 5 kHz 2 A to 11 A	0.084%	



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AC CURRENT (cont'd)			
Generation	<i>10 Hz to 20 Hz</i> 30 μ A to 330 μ A 330 μ A to 330 mA <i>20 Hz to 45 Hz</i> 30 μ A to 330 μ A 330 μ A to 330 mA <i>10 Hz to 45 Hz</i> 330 mA to 3 A 3 A to 11 A <i>45 Hz to 1 kHz</i> 30 μ A to 330 μ A 330 μ A to 330 mA 330 mA to 3 A 3 A to 11 A <i>1 kHz to 5 kHz</i> 30 μ A to 330 μ A 330 μ A to 3 A 3 A to 11 A <i>45 Hz to 100 Hz</i> 11 A to 20.5 A <i>1.1 A to 1025 A</i> 45 Hz to 65 Hz 65 Hz to 100 Hz	650 ppm + 0.6 μ A 700 ppm 550 ppm + 0.6 μ A 550 ppm 700 ppm 850 ppm 550 ppm + 0.6 μ A 550 ppm 650 ppm 600 ppm 0.13% + 0.6 μ A 0.14% 2.6% 1.1% 0.4% 1%	For the calibration of clampmeters only
DC RESISTANCE			
Measurement	up to 20 Ω 20 Ω to 200 Ω 200 Ω to 12 k Ω 12 k Ω to 120 k Ω 0.12 M Ω to 1.2 M Ω 1.2 M Ω to 12 M Ω 12 M Ω to 120 M Ω 120 M Ω to 2 G Ω	22 ppm + 1 $\mu\Omega$ 12 ppm 8 ppm 11 ppm 18 ppm 400 ppm 700 ppm 720 ppm	
Sourcing	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω	36 ppm 32 ppm 20 ppm 20 ppm 18 ppm 18 ppm 16 ppm 16 ppm 16 ppm 16 ppm 16 ppm 16 ppm 16 ppm	



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DC RESISTANCE (cont'd)			
Sourcing (cont'd)	1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	22 ppm 48 ppm 82 ppm 240 ppm	
Other Values	Up to 11 Ω 11 Ω to 33 Ω 33 Ω to 110 Ω 110 Ω to 330 Ω 330 Ω to 1.1 k Ω 1.1 k Ω to 3.3 k Ω 3.3 k Ω to 11 k Ω 11 k Ω to 33 k Ω 33 k Ω to 110 k Ω 110 k Ω to 330 k Ω 330 k Ω to 1.1 M Ω 1.1 M Ω to 3.3 M Ω 3.3 M Ω to 11 M Ω 11 M Ω to 33 M Ω 33 M Ω to 110 M Ω 110 M Ω to 330 M Ω 330 M Ω to 1.1 G Ω	80 ppm + 0.27 m Ω 330 ppm 56 ppm 39 ppm 30 ppm 26 ppm 25 ppm 26 ppm 25 ppm 32 ppm 28 ppm 110 ppm 130 ppm 630 ppm 670 ppm 0.62% 0.75%	
AC RESISTANCE	50 Hz 0.1 Ω , 0.24 Ω , 1 Ω , 2.4 Ω , 10 Ω , 100 Ω and 1000 Ω	1% + 0.02 Ω	Appropriate for the calibration of phase loop impedance measuring devices
FREQUENCY	0.01 Hz to 1 Hz 1 Hz to 100 kHz 100 kHz to 1 MHz 1 MHz to 125 MHz	6ppm 1 in 10 ⁶ 1 in 10 ⁷ 3 in 10 ⁸	
TIME INTERVAL	30 ms, 40 ms, 50 ms, 100 ms and 1000 ms	1% + 0.5 ms	Appropriate for the calibration of RCD testers
CAPACITANCE	1 kHz 190 pF to 400 pF 0.4 nF to 1.1 nF 1.1 nF to 3.3 nF 3.3 nF to 11 μ F	2.6% 0.8% 0.4% 0.3%	
TEMPERATURE INDICATORS, calibration by electrical simulation			
Cold junction	17 $^{\circ}$ C to 23 $^{\circ}$ C	0.2 $^{\circ}$ C	For reporting CJ value in ambient conditions for electrical simulation of temperature.
Noble metal thermocouples	0 $^{\circ}$ C to 1820 $^{\circ}$ C	0.40 $^{\circ}$ C	Excluding cold junction compensation



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TEMPERATURE INDICATORS, calibration by electrical simulation (cont'd)			
Base metal thermocouples	-200 °C to -100 °C -100 °C to 1380 °C	0.25 °C 0.15 °C	Excluding cold junction compensation
	-200 °C to -100 °C -100 °C to 1380 °C	0.40 °C 0.25 °C	Including cold junction compensation
Resistance sensors	-200 °C to 800 °C	0.02 °C	(PT 100)



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED			
LENGTH			
Feeler gauges	As BS 957:2008	3	<p>1 All calibrations must be carried out in accordance with the requirements of the stated standards or with procedures agreed with UKAS.</p> <p>2 All linear calibrations may be made in inch units.</p> <p>3 The uncertainty quoted is for the departure from: flatness, straightness, or squareness; ie the distance separating the two parallel planes which just enclose the surface under consideration.</p>
Gap Gauges (Plain parallel)	As BS 969:2008 From 0.5 up to 100 Above 100 up to 200 Above 200 up to 300	3 5 8	
Length Gauges, Flat and Spherical-ended (excluding length bars)	Up to 3000	1 + (8 x length in m)	
Plain Plug Gauges (parallel) cylindrical setting standards and rollers	From 1 up to 50 diameter Above 50 up to 100 diameter Above 100 up to 150 diameter	0.8 1.0 1.5 } on diameter	
Plain ring gauges (parallel)	From 5 up to 15 diameter Above 15 up to 50 diameter Above 50 up to 100 diameter Above 100 up to 150 diameter Above 150 up to 200 diameter Above 200 up to 500 diameter	2 1.8 2 2.5 3 8 } on diameter	
MEASUREMENT INSTRUMENTS AND EQUIPMENT			
Dial gauges	As BS 907:2008 and BS 2795:1981	1.0	
Micrometers			
External	As BS 870:2008 and above	Heads: 2.0 between any two points. Setting and extension rods 1 + (8 x length in m)	
Internal	As BS 959:2008 and above		
Depth	As BS 6468:2008		
Vernier caliper gauges	As BS 887:2008	Overall performance 10 + (30 x length in m)	
Vernier depth gauges	As BS 6365:2008		
Vernier height gauges	As BS 1643:2008		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED			
ACOUSTICS Sound pressure level of sound calibrators CEL type 282 Verification of sound level meters to BS 7580:Part 1:1997	1000 Hz	0.13 dB	With GRAS microphone type 40 AG or Brüel and Kjaer microphone type 4192 Sound level meter CEL type 424 HSE with microphone type CEL 425 supplied with appropriate sound calibrator
END			