

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK



8239

Accredited to
ISO/IEC 17025:2017

PASS (Portable Appliance Safety Services) Ltd

Issue No: 013 Issue date: 03 October 2022

1 Wilson Street
Thornaby
Stockton-On-Tees
TS17 7AR
United Kingdom

Contact: Mr Ibrahim Ibrahim
Tel: +44 (0) 1642 626148
Fax: +44 (0) 870 143 1869
E-Mail: ibrahim@calibrate.co.uk
Website: www.calibrate.co.uk

Calibration performed at the above address only

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
ELECTRICAL			All electrical calibrations are performed as a comparison against a reference standard
DC RESISTANCE			
Fixed value sources for the calibration of measuring instruments	0.1 Ω 0.2 Ω 0.3 Ω 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	5.8 m Ω 41 m Ω 41 m Ω 6.0 m Ω 8.2 m Ω 490 $\mu\Omega$ 4.8 m Ω 49 m Ω 980 m Ω 33 Ω 3.1 k Ω 210 k Ω 12 M Ω	
For generating a stimulus that can be applied to measuring instruments also for measuring a stimulus provided by the device being calibrated	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω	17 $\mu\Omega/\Omega$ + 59 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 590 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 740 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 6.6 m Ω 12 $\mu\Omega/\Omega$ + 76 m Ω 17 $\mu\Omega/\Omega$ + 3.3 Ω 58 $\mu\Omega/\Omega$ + 130 Ω 580 $\mu\Omega/\Omega$ + 2.8 k Ω 0.58 % + 94 k Ω	
DC VOLTAGE			
Values can be generated for the calibration of measuring instruments	0 mV to 202 mV 202 mV to 1 V 1 V to 2.02 V 2.02 V to 10 V 10 V to 20.2 V 20.0 V to 100 V 100 V to 202 V 202 V to 1020 V	17 $\mu\text{V}/\text{V}$ + 2.5 μV 10 $\mu\text{V}/\text{V}$ + 3.6 μV 10 $\mu\text{V}/\text{V}$ + 7.6 μV 9.8 $\mu\text{V}/\text{V}$ + 43 μV 9.8 $\mu\text{V}/\text{V}$ + 72 μV 14 $\mu\text{V}/\text{V}$ + 430 μV 14 $\mu\text{V}/\text{V}$ + 720 μV 14 $\mu\text{V}/\text{V}$ + 2.8 mV	
For measurement of instrument Outputs	0 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	5.8 $\mu\text{V}/\text{V}$ + 390 nV 4.6 $\mu\text{V}/\text{V}$ + 430 nV 4.6 $\mu\text{V}/\text{V}$ + 1.2 μV 6.9 $\mu\text{V}/\text{V}$ + 54 μV 15 $\mu\text{V}/\text{V}$ + 1.3 mV	



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DC CURRENT Values can be generated for the calibration of measuring instruments	0 μ A to 202 μ A 202 μ A to 1 mA 1 mA to 2.02 mA 2.02 mA to 10 mA 10 mA to 20.2 mA 20.2 mA to 100 mA 100 mA to 202 mA 202 mA to 1 A 1 A to 2.02 A 2.02 A to 10 A 10 A to 20.2 A 20.2 A to 30 A	120 μ A/A + 12 nA 58 μ A/A + 35 nA 58 μ A/A + 49 nA 58 μ A/A + 230 nA 58 μ A/A + 440 nA 58 μ A/A + 2.3 μ A 58 μ A/A + 9.0 μ A 150 μ A/A + 36 μ A 150 μ A/A + 100 μ A 350 μ A/A + 590 μ A 350 μ A/A + 760 μ A 580 μ A/A + 4.4 mA	
	20 A to 1500 A	0.26 % + 13 mA	Simulation with coil
For measurement of instrument outputs	0 μ A to 1 μ A 1 μ A to 10 μ A 10 μ A to 100 μ A 100 μ A to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A 3 A to 5 A 5 A to 10 A	24 μ A/A + 48 pA 23 μ A/A + 130 pA 23 μ A/A + 950 pA 23 μ A/A + 6.0 nA 23 μ A/A + 60 nA 40 μ A/A + 630 nA 130 μ A/A + 13 μ A 0.23 % + 750 μ A 0.14 % + 2.6 mA 0.27 % + 4.4 mA	
AC VOLTAGE Values can be generated for the calibration of measuring instruments	20 mV to 202 mV 10 Hz to 44 Hz 45 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 100 kHz 100 kHz to 500 kHz	920 μ V/V + 62 μ V 190 μ V/V + 62 μ V 230 μ V/V + 56 μ V 0.12 % + 84 μ V 0.46 % + 2.5 mV	
	202 mV to 2.02 V 10 Hz to 44 Hz 45 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 100 kHz	580 μ V/V + 320 μ V 180 μ V/V + 280 μ V 240 μ V/V + 450 μ V 750 μ V/V + 530 μ V	
	2.02 V to 20.2 V 10 Hz to 44 Hz 45 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 100 kHz	580 μ V/V + 3.0 mV 180 μ V/V + 2.7 mV 240 μ V/V + 4.4 mV 690 μ V/V + 5.3 mV	
	20.2 V to 202 V 30 Hz to 44 Hz 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 40 kHz	580 μ V/V + 33 mV 170 μ V/V + 28 mV 270 μ V/V + 30 mV 350 μ V/V + 53 mV	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
Generation (cont'd)	202 V to 1020 V 30 Hz to 44 Hz 45 Hz to 1 kHz 1 kHz to 10 kHz	640 μ V/V + 250 mV 230 μ V/V + 110 mV 290 μ V/V + 200 mV	
For measurement of instrument outputs	10 μ V to 10 mV 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 100 kHz	230 μ V/V + 2.6 μ V 350 μ V/V + 2.6 μ V 0.12 % + 2.6 μ V	
	10 mV to 100 mV 40 Hz to 1 kHz 1 kHz to 20 kHz	82 μ V/V + 3.3 μ V 160 μ V/V + 3.3 μ V	
	100 mV to 1 V 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	82 μ V/V + 48 μ V 82 μ V/V + 27 μ V 160 μ V/V + 28 μ V 350 μ V/V + 30 μ V 920 μ V/V + 31 μ V	
	1 V to 10 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz	82 μ V/V + 510 μ V 82 μ V/V + 270 μ V 160 μ V/V + 270 μ V 350 μ V/V + 310 μ V 920 μ V/V + 320 μ V 0.35 % + 1.2 mV 1.2 % + 3.2 mV	
	10 V to 100 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	230 μ V/V + 4.9 mV 230 μ V/V + 2.8 mV 230 μ V/V + 2.9 mV 400 μ V/V + 3.2 mV 0.14 % + 3.8 mV	
	100 V to 700 V 10 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz	460 μ V/V + 52 mV 460 μ V/V + 26 mV 690 μ V/V + 28 mV	



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AC CURRENT			
Values can be generated for the calibration of measuring Instruments	20 μ A to 202 μ A 40 Hz to 1 kHz	580 μ A/A + 180 nA	
	202 μ A to 2.02 mA 40 Hz to 1 kHz	460 μ A/A + 460 nA	
	2.02 mA to 20.2 mA 40 Hz to 1 kHz	400 μ A/A + 4.6 μ A	
	20.2 mA to 202 mA 40 Hz to 1 kHz	400 μ A/A + 46 μ A	
	202 mA to 2.02 A 40 Hz to 1 kHz	460 μ A/A + 550 μ A	
	2.02 A to 20 A 40 Hz to 100 Hz	650 μ A/A + 6.0 mA	
	20 A to 30 A 40 Hz to 100 Hz	650 μ A/A + 13 mA	
	20 A to 1500 A 40 Hz to 60 Hz	0.26 % + 13 mA	Simulation using coil
For measurement of instrument outputs	50 nA to 100 μ A 100 Hz to 5 kHz	700 μ A/A + 46 nA	
	100 μ A to 1 mA 100 Hz to 5 kHz	350 μ A/A + 230 nA	
	1 mA to 10 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 5 kHz	0.46 % + 2.3 μ A 0.17 % + 2.3 μ A 690 μ A/A + 2.3 μ A	
	10 mA to 100 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 5 kHz	0.17 % + 24 μ A 690 μ A/A + 24 μ A 350 μ A/A + 24 μ A	
	100 mA to 1 A 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 5 kHz	0.46 % + 240 μ A 920 μ A/A + 240 μ A 0.12 % + 240 μ A	
	1 A to 3 A 10 Hz to 5 kHz	0.27 % + 580 μ A	
	3 A to 5 A 10 Hz to 5 kHz	0.27 % + 11 mA	
	5 A to 10 A 10 Hz to 5 kHz	0.29 % + 11 mA	



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CAPACITANCE Values can be generated for the calibration of measuring Instruments	<i>At 1 kHz:</i> 1 nF 10 nF 20 nF 50 nF 100 nF 1 μ F 10 μ F	3.5 pF 31 pF 64 pF 150 pF 290 pF 4.6 nF 69 nF	
These range values can also be measured	1 pF to 100 pF 100 pF to 1000 pF 1 nF to 10 nF 10 nF to 100 nF 0.1 μ F to 1 μ F 1 μ F to 10 μ F	0.12 % + 0.12 pF 0.12 % + 0.33 pF 0.12 % + 3.1 pF 0.12 % + 31 pF 0.12 % + 310 pF 0.12 % + 0.31 nF	Comparison against LCR bridge
INDUCTANCE Values can be generated for the calibration of measuring instruments	<i>At 1 kHz:</i> 1 mH 10 mH 100 mH 1 H	5.9 μ H 58 μ H 580 μ H 5.8 mH	
These range values can also be measured	0.1 mH to 1 mH 1 mH to 10 mH 10 mH to 100 mH 0.1 H to 1 H	0.12 % + 0.39 μ H 0.27 % + 3.9 μ H 0.12 % + 35 μ H 0.12 % + 300 μ H	Comparison against LCR bridge
FREQUENCY Value can be generated for the calibration of measuring instruments	10 MHz reference	1.0 part in to 10^{12}	Frequency may also expressed time; $1/f$ for repetitive signals, in terms of seconds or other units such as RPM.
For generating a stimulus that can be applied to measuring instruments also for measuring a stimulus provided by the device being calibrated	1 Hz to 30 MHz 30 MHz to 4 GHz	1.5 parts in to 10^{12} + 0.60 μ Hz 2.0 parts in to 10^{12}	
Rotational speed - Optical			
Measurement	10 RPM to 99.99 RPM 100 RPM to 999.9 RPM 1000 RPM to 99999 RPM	2.3 RPM 2.4 RPM 3.3 RPM	
Generation	60 RPM to 3000 RPM 3000 RPM to 60000 RPM	0.12 RPM 1.2 RPM	



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TEMPERATURE SIMULATION			
PT 100	-200 °C to +800 °C	0.065 °C	
Ambient	17 °C to 23 °C	0.20 °C	
junction compensation INCLUDED			
Base Thermocouples			
Type E	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1000 °C	0.22 °C 0.21 °C 0.22 °C	
Type J	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1200 °C	0.24 °C 0.21 °C 0.22 °C	
Type K	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1372 °C	0.27 °C 0.22 °C 0.24 °C	
Type N	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1300 °C	0.35 °C 0.24 °C 0.24 °C	
Type T	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 400 °C	0.27 °C 0.23 °C 0.21 °C	
Noble thermocouples			
Type B	600 °C to 1820 °C	0.52 °C	
Type R	-50 °C to 0 °C 0 °C to 400 °C 400 °C to 1767 °C	0.78 °C 0.57 °C 0.36 °C	
Type S	-50 °C to 0 °C 0 °C to 400 °C 400 °C to 1767 °C	0.65 °C 0.55 °C 0.40 °C	



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Temperature indicators and calibrators by electrical simulation Reference junction compensation EXCLUDED			
Base Thermocouples			
Type E	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1000 °C	0.22 °C 0.19 °C 0.20 °C	
Type J	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1200 °C	0.24 °C 0.19 °C 0.20 °C	
Type K	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1372 °C	0.26 °C 0.21 °C 0.22 °C	
Type N	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 1300 °C	0.35 °C 0.22 °C 0.22 °C	
Type T	-200 °C to -100 °C -100 °C to 0 °C 0 °C to 400 °C	0.26 °C 0.21 °C 0.20 °C	
Noble thermocouples			
Type B	600 °C to 1820 °C	0.52 °C	
Type R	-50 °C to 0 °C 0 °C to 400 °C 400 °C to 1767 °C	0.77 °C 0.56 °C 0.35 °C	
Type S	-50 °C to 0 °C 0 °C to 400 °C 400 °C to 1767 °C	0.65 °C 0.55 °C 0.39 °C	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
EQUIPMENT FOR IEE 16 TH / 17 TH / 18 TH EDITION WIRING TESTING			
LOOP TESTERS			
AC Resistance at 50 Hz	Nominal applied resistances		
	0.05 Ω	4.7 m Ω	
	0.10 Ω	4.8 m Ω	
	0.21 Ω	4.9 m Ω	
	0.32 Ω	5.1 m Ω	
	0.5 Ω	5.6 m Ω	
	1 Ω	8.6 m Ω	
	5 Ω	31 m Ω	
	10 Ω	59 m Ω	
	100 Ω	580 m Ω	
	1 k Ω	5.9 Ω	
CONTINUITY TESTERS			
DC Resistance	20 m Ω	29 m Ω	
	200 m Ω to 2 Ω	29 m Ω	
	4 Ω	31 m Ω	
	6 Ω	34 m Ω	
	8 Ω	37 m Ω	
	10 Ω	41 m Ω	
	20 Ω	65 m Ω	
	100 Ω	290 m Ω	
	1 k Ω	2.9 Ω	
Continuity Current Measurement	10 mA	1.1 mA	
	100 mA	1.7 mA	
	200 mA	3.1 mA	
	300 mA	4.6 mA	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
INSULATION TESTERS			
DC Resistance	10 k Ω	12 Ω	
	20 k Ω	23 Ω	
	30 k Ω	35 Ω	
	40 k Ω	46 Ω	
	60 k Ω	69 Ω	
	100 k Ω	120 Ω	
	200 k Ω	230 Ω	
	400 k Ω	460 Ω	
	600 k Ω	690 Ω	
	1 M Ω	1.2 k Ω	
	2 M Ω	2.3 k Ω	
	3 M Ω	3.5 k Ω	
	4 M Ω	4.6 k Ω	
	5 M Ω	58 k Ω	
	6 M Ω	69 k Ω	
	7 M Ω	81 k Ω	
	8 M Ω	92 k Ω	
	9 M Ω	100 k Ω	
	10 M Ω	120 k Ω	
	20 M Ω	230 k Ω	
	30 M Ω	350 k Ω	
	40 M Ω	460 k Ω	
	50 M Ω	580 k Ω	
	60 M Ω	690 k Ω	
	70 M Ω	810 k Ω	
	80 M Ω	930 k Ω	
	90 M Ω	1.0 M Ω	
100 M Ω	1.2 M Ω		
200 M Ω	2.8 M Ω		
400 M Ω	5.6 M Ω		
600 M Ω	8.5 M Ω		
800 M Ω	11 M Ω		
1 G Ω	14 M Ω		
10 G Ω	580 M Ω		
DC Voltage	50 V	1.1 V	
	100 V	1.5 V	
	150 V	2.0 V	
	200 V	2.5 V	
	250 V	3.0 V	
	500 V	5.9 V	
	1000 V	12 V	



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EARTH BOND TESTERS			
AC Resistance at 50 Hz	Nominal applied resistance		
	0.04 Ω	4.7 m Ω	
	0.1 Ω	4.8 m Ω	
	0.15 Ω	4.8 m Ω	
	0.27 Ω	5.0 m Ω	
	0.38 Ω	5.2 m Ω	
	0.55 Ω	5.8 m Ω	
	1 Ω	7.8 m Ω	
	5 Ω	30 m Ω	
	10 Ω	59 m Ω	
	100 Ω	580 m Ω	
	1 k Ω	5.8 Ω	
AC Current at 50 Hz	100 mA	7.3 mA	
	200 mA	7.9 mA	
	400 mA	9.9 mA	
	4 A	100 mA	
	8 A	160 mA	
	10 A	190 mA	
	20 A	440 mA	
LEAKAGE TESTERS			
DC Current	2 mA	36 μ A	
	5 mA	82 μ A	
	10 mA	130 μ A	
RCD TESTERS			
RCD Trip Time	20 ms	680 μ s	
	40 ms	680 μ s	
	100 ms	680 μ s	
	200 ms	680 μ s	
	390 ms	680 μ s	
	900 ms	8.1 ms	
RCD Trip Current at 50 Hz	10 mA	620 μ A	
	30 mA	1.7 mA	
	90 mA	5.2 mA	
	100 mA	5.8 mA	
	110 mA	6.4 mA	
	150 mA	17 mA	
	300 mA	17 mA	
	1 A	58 mA	
	2 A	120 mA	
AC Voltage Source at 50 Hz	100 V	0.37 V	
	200 V	0.45 V	
	230 V	0.65 V	
	300 V	0.82 V	
	400 V	0.99 V	
Line Voltage Measurement	200 V to 260 V	2.4 V	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ($k = 2$)	Remarks
PRESSURE			
Gas Pressure (Gauge)			Methods consistent with EURAMET CG17. Calibration of devices with an electrical output may be undertaken.
Calibration of pressure indicating instruments and gauges	-95 kPa to -10 kPa -10 kPa to -1.5 kPa 1.5 kPa to 10 kPa 10 kPa to 100 kPa 100 kPa to 2.5 MPa 2.5 MPa to 11.1 MPa	0.005 1 % 0.004 7 % + 0.15 Pa 0.003 8 % + 0.15 Pa 0.004 1 % 0.004 4 % 0.006 6 %	Calibration using deadweight testers. Absolute pressures can be generated over these ranges attracting an additional uncertainty of 0.15 Pa.
Calibration of pressure indicating instruments and gauges	3.5 kPa to 200 kPa 100 kPa to 2.1 MPa -95 kPa to +21 MPa	0.004 6 % + 13 Pa 0.002 5 % + 90 Pa 0.006 1 % + 2.0 kPa	Calibration using pressure controllers.
Gas Pressure (Absolute)			
Calibration of pressure indicating instruments and gauges	3.5 kPa to 100 kPa 3.5 kPa to 800 kPa 3.5 kPa to 7 MPa 100 kPa to 41.4 MPa	0.007 5 % + 3.8 Pa 0.018 % + 24 Pa 0.010 % + 210 Pa 0.007 4 % + 1.7 kPa	Calibration using pressure controllers.
Hydraulic Pressure (Gauge)			
Calibration of pressure indicating instruments and gauges	0.6 MPa to 6.0 MPa 6 MPa to 70 MPa 70 MPa to 138 MPa	0.007 6 % 0.006 2 % 0.010 %	Calibration using deadweight testers. Absolute pressures can be generated over these ranges attracting an additional uncertainty of 0.15 Pa.
TEMPERATURE			
Sensors with indicators	-95 °C to -50 °C -50 °C to +140 °C 140 °C to 660 °C	0.10 °C 0.050 °C 0.10 °C	Calibrations performed in a Metal block
	-80 °C to 0 °C 0 °C to 100 °C	0.011 °C 0.011 °C	Calibrations performed in liquid bath
	0.01 °C	0.0050 °C	Triple point of water
Metal block calibrators and portable liquid baths	-95 °C to +660 °C	Uncertainty as for sensor and indicator	
HUMIDITY			
Relative humidity	At 0 °C 5 %rh 50 %rh 90 %rh	0.20 %rh 0.90 %rh 1.6 %rh	
	At 23 °C 5 %rh to 10 %rh 10 %rh to 50 %rh 50 %rh to 95 %rh	0.21 %rh 0.75 %rh 1.8 %rh	



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HUMIDITY (continued)			
Relative humidity	At 60 °C 5 %rh 50 %rh 90 %rh	0.20 %rh 0.60 %rh 1.0 %rh	
TEMPERATURE IN AIR	0 °C to 23 °C 23 °C 23 °C to 60 °C	0.14 °C 0.12 °C 0.14 °C	
END			



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Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand. Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation $Q[a, b]$ stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$