


# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

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

 <p><b>UKAS</b> CALIBRATION</p> <p>0720</p> <p>Accredited to ISO/IEC 17025:2017</p>	<p><b>Rhopoint Metrology Limited</b></p> <p>Issue No: 042 Issue date: 13 October 2023</p>	
	<p><b>Eurolab House</b> Unit 10 Valepits Road Garretts Green Industrial Estate Birmingham B33 0TD</p>	<p><b>Contact: Dean Hughes</b> Tel: +44 (0)121 784 7498 Fax: +44 (0)121 783 6031 E-Mail: dean.hughes@rhpointmetrology.co.uk Website: www.rhopointmetrology.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 locations:

Location details	Activity	Location code
<p><b>Address</b> Dean Hughes Eurolab House Unit 10 Valepits Road Garretts Green Industrial Estate Birmingham B33 0TD</p>	<p>Dimensional Electrical Mass Pressure</p>	A
<p><b>Address</b> Dean Hughes Unit 28 Old Mills Industrial Estate Paulton Bristol BS39 7SU</p>	<p>Dimensional Temperature Electrical</p>	B
<p><b>Address</b> Dean Hughes Rhopoint House Enviro 21 Business Park Queensway Avenue South St Leonards on Sea East Sussex TN38 9AG</p>	<p>Gloss</p>	D



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**Site activities performed away from the locations listed above:**

Location details	Activity	Location code
At customers premises      Dean Hughes	Dimensional Electrical Mass Pressure	C



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Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
LENGTH			NOTES	
Gauge blocks		Class (see footnote)		A
Inch (Steel and tungsten carbide)	BS 4311:2007 0.01 in to 0.4 in 0.4 in up to 1 in Size 2 in 3 in 4 in Variation	C D 3.0 4.0 4.0 5.0 5.0 7.0 $\mu$ in 6.0 8.0 7.0 10 3.0	By comparison with reference end standards	
Millimetre (Steel and tungsten carbide)	BS EN ISO 3650:1999 0.5 to 10 10 up to 25 Size 30, 40, 50 60, 70, 75 80, 90, 100 Variation	C D 0.080 0.10 0.10 0.13 0.12 0.17 0.15 0.21 0.18 0.25 0.08		
<p><b>Footnote</b>  <b>Class C</b> uncertainties apply to the measurement of length of steel and tungsten carbide gauges by comparison with grade K standards of length of a similar material. Class C uncertainties apply to grade 0, 1 and 2 gauges to BS EN ISO 3650:1999 and BS 4311:2007.  <b>Class D</b> uncertainties represent the best capability for the measurement of length of gauges by comparison with grade K standards of length of a dissimilar material.</p>				
<p><b>Notes</b></p> <ol style="list-style-type: none"> <li>The uncertainty quoted is for the departure from either flatness, straightness, parallelism, or squareness, i.e. the distance separating the two parallel planes which just enclose the surface under consideration.</li> <li>Single start, symmetrical thread forms only.</li> <li>Single and multi-start symmetrical and asymmetrical thread forms</li> <li>Functional test of size using setting plugs calibrated with a CMC of 3.0 <math>\mu</math>m</li> <li>Includes use of check plugs for screw rings from 1 mm to 2.5 mm diameter.</li> <li>The stated uncertainty has been calculated in accordance with ISO 14253-5 and relates to the test value uncertainty. The uncertainty quoted excludes contributions relating to the instrument under test</li> </ol>				



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
LENGTH (cont.)				
Thread measuring cylinders	BS 5590 and specials 0.1 to 5	0.50	By comparison with reference standards	A
Plain plug gauges (parallel) cylindrical setting standards and rollers	1 to 25 diameter 25 to 100 diameter 100 to 150 diameter 150 to 200 diameter 200 to 300 diameter 300 to 600 diameter  Concentricity TIR	0.80 1.0 1.3 1.6 2.2 4.0  1.4	on diameter  By comparison with reference standards	A
Plain plug gauges (taper)				A
Parallel to 1 in 8 on diameter	3 to 50 diameter 50 to 100 diameter 100 to 200 diameter 200 to 300 diameter	3.0 4.0 5.0 6.0	on diameter  By comparison with reference standards	
1 in 8 to 1 in 3 on diameter	3 to 50 diameter 50 to 100 diameter 100 to 200 diameter 200 to 300 diameter	5.0 6.0 7.0 8.0		
Plain ring gauges (parallel) and setting standards	2 to 25 diameter 25 to 100 diameter 100 to 150 diameter 150 to 200 diameter 200 to 400 diameter 400 to 600 diameter	0.8 1.0 2.0 3.0 4.0 6.0	on diameter  By comparison with reference standards	A



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
LENGTH (cont'd) Plain ring gauges (taper)				A
Parallel to 1 in 8 on diameter	2 to 50 diameter 50 to 100 diameter 100 to 150 diameter 150 to 200 diameter	4.0 5.0 6.0 7.0	on diameter	
1 in 8 to 1 in 3 on diameter	2 to 50 diameter 50 to 100 diameter 100 to 150 diameter 150 to 200 diameter	6.0 7.0 8.0 9.0	By comparison with reference standards	
Length gauges, flat and spherical ended	0 to 600	1.0 + (5.0 x length in m)	By comparison with reference standards	A
Plain gap gauges (parallel)	0.5 to 100 100 to 200 200 to 300	3.0 5.0 8.0	By comparison with reference standards	A
Receiver, position and profile gauges, jigs, fixtures (see note 1)	0 to 400 x 200 x 200	Minimum per coordinate: 3.0 + (10 x length in m)	Using documented in- house methods	A
Parallels	As BS 906:1972 5 to 50 x 100 x 400	0.5 to 5.0		A
Vee blocks	As BS 3731:1987 20 to 150	2.5 to 5.0		A
Screw plug gauges (parallel) including check and setting plugs See Note 3	1 to 100 diameter 100 to 300 300 to 600	3.0 5.0 8.0	on pitch diameter	A
Screw plug gauges (taper) including check plugs See Note 2	2 to 100 100 to 300 300 to 500	5.0 8.0 10		
Screw ring gauges (parallel) See Note 3 and 5	1 to 100 diameter 100 to 150 150 to 200 200 to 300 300 to 600	5.0 6.0 7.0 8.0 12	on pitch diameter	Methods consistent with NPL Notes on Applied Science No. 1.
Screw ring gauges (tapered) See Note 2	6 to 100 diameter 100 to 200 200 to 400 400 to 600	7.0 10 13 16		
Screw pitch Screw flank angle	0.2 to 8 0° to 52°	1.5 5.0 minutes of arc	Mechanical and optical comparison	
Screw thread adjustable caliper gauges (parallel) See Note 3	1 to 200 diameter	See note 5	By use of setting plugs	A



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
LENGTH (cont'd)				
Vee grooved jaw blades	0.6 (40 tpi) to 6.0 (4.5 T.P.I)	3.0	Documented in-house methods.	A
Vee grooved end pieces	0.6 (40 T.P.I) to 6.0 (4.5 T.P.I)	3.0	Documented in-house methods.	A
Plain end pieces	0 to 0.001	0.50 on flatness	Documented in-house methods.	A
Thread Stylii	0.6 (40 T.P.I) to 6.0 (4.5 T.P.I)	0.10 on form	Documented in-house methods.	A
Thread measuring vee pieces (prisms)	NPL Schedule MOY/SCM1/60 0 to 4.5	0.50		A
Orifice plates	BS EN ISO 5167-2:2003 12.5 to 200 bore (d) diameters 200 to 500 bore (d) diameters Plate thickness (E) Edge thickness (e) Surface roughness - Ra	8.0 11 10 150 7.0 % of measured Ra, minimum 0.10		A
Penetration needles and cones	Needles to BS 2000-49:2007 0 to 2 diameter Cones to BS 2000:Part 50:1993 0 to 10 diameter	3.0 on diameter Mass 5.0 mg		A



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
ANGLE				
Squares				A
Blade type	BS 939:2007 50 to 300 300 to 600 600 to 1000	3.0 5.0 8.0		
Cylindrical	BS 939:2007 75 to 450 450 to 600 600 to 1000	2.5 3.5 7.0	On squareness See Note 1	
Block	BS 939:2007 50 to 300 300 to 600 600 to 1000	3.0 5.0 8.0		
Angle plates and box angle plates	BS 5535:1978 50 to 450	Squareness: 3.0 + (1.0 per 100 mm) Flatness and Parallelism: 1.2 + (1.0 per 100 mm) See Note 1		A
Sine bars and tables	BS 3064:1978 0 up to 500	Linear dimensions: 1.0 + (10 x length in m) Overall performance: 3.0 seconds of arc		A
Compound sine tables	0 to 500 length	Linear dimensions: 1.0 + (10 x length in m) Overall performance: 3.0 seconds or arc	In house methods based on BS 3064:1978	A



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
FORM				
Roundness External Internal	0 to 350 diameter 5 to 350 diameter	0.050 on radius	Mechanical styus form measurement	A
Straightedges Cast iron, Steel and Granite	BS 5204:Part 1:1975 BS 5204:Part 2:1977 0 to 2000	1.0 + (2.0 x length in m) See Note 1		A
Precision balls: Steel and Tungsten Carbide	1 to 30	0.80 on diameter	By comparison with reference standards	A
Surface plates Granite & cast iron	BS 817:2008 160 x 100 to 10m x 6m			A, C
	Flatness of working surface (Note1):	1.50 + (0.80 x diagonal in m)		
	Local variation of working surface:	3.0		
Surface texture (excluding measurement standards and roughness comparison specimens)	BS 1134:Part 1:1988 Ra 0.02 $\mu\text{m}$ to 80 $\mu\text{m}$	7.0 % of measured Ra, minimum 0.10		A





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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
MEASURING INSTRUMENTS AND MACHINES				
Micrometers				
External micrometer	BS 870:2008 0 to 600  Heads: (Zero) Setting, 0 to 25: (Zero) Setting, 25 to 600: Flatness of anvils: Parallelism of anvils:	2.0 between any two points 1.0 1.0 + (5.0 x length in m) 1.0 2.0		A
Internal micrometer	BS 959:2008 0 to 900	Heads: 2.0 between any two points Setting and extension rods: 1.0 + (5.0 x length in m)		A
Depth micrometer	BS 6468:2008 0 to 300	Heads: 2.0 between any two points Setting and extension rods: 1.0 + (5.0 x length in m)		A
3 point bore	0 to 150 150 to 250	5.0 8.0		A
Micrometer heads	BS 1734:1951 0 to 100	1.0		A
Bench micrometer	NPL MOY/SCMI 22 0 to 100	Overall performance 2.0		A
Height gauges - (Simple) including vernier, dial and digital types	BS EN ISO 13225:2012 0 to 1000	Overall performance: 2.0 + (5.0 x length in m)		
Vernier, digital electronic, dial caliper, height and depth gauges	BS 887:2008 0 to 1000 BS 1643:2008 0 to 1000 BS 6365:2008 0 to 600	Overall performance 10 + (30 x length in m)		A



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Calipers (see note 6)	ISO 13385-1 2019 Partial surface contact error (E) 0 to 1000 mm	4.0		A
	Shift error (S) internal jaws 3 to 50 mm	4.0		
	Shift error (S) depth and step 3 to 50 mm	4.0		
Dial gauges and dial test indicators	BS 907:2008 and BS 2795:1981 0 to 50	1.0		A
Displacement transducers	0 to 200	1.0	Documented in-house methods.	A
Height setting micrometer	0 to 300	Heads 1.0 Overall performance 3.0	Documented in-house methods.	A
Riser blocks for above	150 300	2.5 5.0	By comparison with reference standards	A



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
MEASURING INSTRUMENTS AND MACHINES (cont'd)			!	
Height gauges, electronic	0 to 1000	1.0 + (5.0 x length in m)	Documented in-house methods.	A
Profile projectors	10 to 100 magnifications Linear 0 to 300 Angular 0° to 360°	Magnification 125 at screen Linear 5.0 Angular 2.0 mins of arc	Mechanical and optical comparison	A, C
Bevel protractors	As BS 1685:2008 0° to 360°	6 0 minutes of arc		A
Comparators (external), including electronic	Based on BS 1054 250 to 10 000 magnifications and / or 0 to 0.5	1.0 % or range Minimum 0.25		A
Co-ordinate tables	0 to 500 square with 150 movement	Overall performance 3.0	Documented in-house methods.	A
Spirit levels	As BS 3509:1962 and BS 958:1968 5 seconds of arc to 60 minutes of arc nominal sensitivity	Mean sensitivity 10 % of nominal Minimum 0.50 seconds of arc		A
Electronic indicating levels	0 to 20 minutes of arc	1.0 % or range Minimum 0.50 seconds of arc	Documented in-house methods based on BS 3509:1962	A
Luer (taper) gauges	BS 3930:Part 1:1987 and BS 3930:Part 2:1991 0.3 to 8	As per plain taper and screw taper gauges above		A
Steel Rules	BS 4372:1968 0 to 1000	15 + (20 x L in m)		A
Feeler gauges	BS 957:2008 0.025 to 1	3.0		A
Paint thickness setting foils / shims	0 to 2	3.0	Calibration by comparison to length standards using a length measuring instrument	A
Thread diameter measuring	MOY/SCM1/9 and MOY/SCM1/12 0 to 300	Overall performance 1.5		A



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
<b>PRESSURE</b>			Methods consistent with EURAMET CG3 and CG17	
<u>Hydraulic pressure (gauge)</u>				
Calibration of pressure indicating instruments and gauges, Pressure equivalent calibration of deadweight testers.	550 kPa to 110 MPa	0.017 %	Calibration of devices with an electrical output may be undertaken.	A
	550 kPa to 110 MPa	0.017 %		C
<u>Gas pressure (gauge)</u>				
Calibration of pressure indicating instruments and gauges, Pressure equivalent calibration of deadweight testers.	-97 kPa to -3.5 kPa 3.5 kPa to 100 kPa 100 kPa to 700 kPa 700 kPa to 12 MPa	0.015 % 0.014 % 0.011 % 0.009 %		A
	-90 kPa to -3.5 kPa 3.5 kPa to 100 kPa 600 kPa to 2 MPa 2 MPa to 10 MPa	0.048 % + 10 Pa 0.040 % + 3.0 Pa 0.041 % + 49 Pa 0.064 % + 825 Pa		C
<u>Gas pressure (absolute)</u>				
Calibration of pressure indicating instruments and gauges	3.5 kPa to 130 kPa 103.5 kPa to 200 kPa 200 kPa to 800 kPa 800 kPa to 12 MPa	0.015 % + 9 Pa 0.014 % + 25 Pa 0.011 % + 25 Pa 0.009 % + 25 Pa		A
	80 kPa to 120 kPa 120 kPa to 200 kPa 700 kPa to 2.1 MPa 2.1 MPa to 10.1 MPa	0.048 % + 10 Pa 0.11 % + 10 Pa 0.10 % + 49 Pa 0.12 % + 825 Pa		C



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
<b>ELECTRICAL</b>				
The method for all electrical measurements listed below is by direct comparison to laboratory standards unless otherwise described in the remarks column.				
DC Voltage	0 mV to 320 mV 320 mV to 3.2 V 3.2 V to 32 V 32 V to 320 V 320 V to 1020 V	0.0026 % + 1.8 $\mu$ V 0.0014 % + 2.6 $\mu$ V 0.0016 % + 30 $\mu$ V 0.0023 % + 200 $\mu$ V 0.0023 % + 2.0 mV	Source values for the calibration of measuring instruments	B
	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1020 V	0.00080 % + 1.2 $\mu$ V 0.00050 % + 1.3 $\mu$ V 0.00050 % + 4.8 $\mu$ V 0.00070 % + 47 $\mu$ V 0.00070 % + 600 $\mu$ V	Measurement suitable for the calibration of sources	B
DC Current	0 $\mu$ A to 320 $\mu$ A 320 $\mu$ A to 3.2 mA 3.2 mA to 32 mA 32 mA to 320 mA 320 mA to 1.1 A 1.1 A to 3.2 A 3.2 A to 11 A 11 A to 20 A	0.018 % + 24 nA 0.012 % + 60 nA 0.012 % + 300 nA 0.012 % + 3.0 $\mu$ A 0.024 % + 50 $\mu$ A 0.0045 % + 50 $\mu$ A 0.059 % + 600 $\mu$ A 0.12 % + 900 $\mu$ A	Source values for the calibration of measuring instruments	B
	10 A to 100 A 100 A to 550 A 550 A to 1000 A	0.27 % + 0.1 A 0.27 % + 0.24 A 0.29 % + 0.24 A	For the calibration of clamp meters only.	B
	0 $\mu$ A to 200 $\mu$ A 200 $\mu$ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 20 A	0.0039 % + 1.4 nA 0.0017 % + 5.0 nA 0.0018 % + 100 nA 0.0057 % + 1.0 $\mu$ A 0.022 % + 19 $\mu$ A 0.047 % + 500 $\mu$ A	Suitable for the calibration of sources	B
	DC Resistance	0 $\Omega$ to 1 $\Omega$ 1 $\Omega$ to 10 $\Omega$ 10 $\Omega$ to 32 $\Omega$ 32 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 320 $\Omega$ 320 $\Omega$ to 1 k $\Omega$	1.2 m $\Omega$ 0.0077 % + 1.2 m $\Omega$ 0.0047 % + 1.8 m $\Omega$ 0.0036 % + 1.7 m $\Omega$ 0.0035 % + 2.4 m $\Omega$ 0.0034 % + 3.3 m $\Omega$	Source values for the calibration of measuring instruments



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DC Resistance Continued	1 kΩ to 3.2 kΩ	0.0034 % + 24 mΩ	Source values for the calibration of measuring instruments	B
	3.2 kΩ to 10 kΩ	0.0034 % + 33 mΩ		
	10 kΩ to 32 kΩ	0.0034 % + 230 mΩ		
	32 kΩ to 100 kΩ	0.0034 % + 330 mΩ		
	100 kΩ to 320 kΩ	0.0040 % + 2.3 Ω		
	320 kΩ to 1 MΩ	0.0041 % + 3.3 Ω		
	1 MΩ to 3.2 MΩ	0.0075 % + 35 Ω		
	3.2 MΩ to 10 MΩ	0.0154 % + 74 Ω		
	10 MΩ to 32 MΩ	0.0294 % + 2.9 kΩ		
	32 MΩ to 100 MΩ	0.060 % + 6.8 kΩ		
AC Voltage	0 Ω to 1 Ω	32 μΩ	Measurement suitable for the calibration of sources	B
	1 Ω to 20 Ω	0.0012 % + 29 μΩ		
	20 Ω to 200 Ω	0.0010 % + 63 μΩ		
	200 Ω to 2 kΩ	0.0010 % + 580 μΩ		
	2 kΩ to 20 kΩ	0.0010 % + 6.0 mΩ		
	20 kΩ to 200 kΩ	0.0010 % + 58 mΩ		
	200 kΩ to 2 MΩ	0.0012 % + 2.0 Ω		
	2 MΩ to 20 MΩ	0.0027 % + 120 Ω		
	20 MΩ to 200 MΩ	0.015 % + 12 kΩ		
	200 MΩ to 2 GΩ	0.18 % + 1.2 MΩ		
AC Voltage	10 mV to 320 mV	Source values for the calibration of measuring instruments	B	
	45 Hz to 1 kHz			0.018 % + 10 μV
	1 kHz to 10 kHz			0.018 % + 10 μV
	320 mV to 3.2 V			0.018 % + 70 μV
	45 Hz to 1 kHz			0.018 % + 70 μV
	1 kHz to 10 kHz			0.018 % + 70 μV
	3.2 V to 32 V			0.018 % + 700 μV
	45 Hz to 1 kHz			0.018 % + 700 μV
	1 kHz to 10 kHz			0.018 % + 700 μV
	32 V to 320 V			0.023 % + 3.0 mV
45 Hz to 1 kHz	0.024 % + 7.0 mV			
1 kHz to 10 kHz	0.024 % + 7.0 mV			
AC Voltage	320 V to 1020 V	Source values for the calibration of measuring instruments	B	
	45 Hz to 1 kHz			0.036 % + 12 mV
	1 kHz to 10 kHz			0.036 % + 12 mV



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC Voltage	10 mV to 200 mV <i>20 Hz to 1 kHz</i> <i>1 kHz to 10 kHz</i>  200 mV to 2 V <i>20 Hz to 1 kHz</i> <i>1 kHz to 10 kHz</i>  2 V to 20 V <i>20 Hz to 1 kHz</i> <i>1 kHz to 10 kHz</i>  20 V to 200 V <i>20 Hz to 1 kHz</i> <i>1 kHz to 10 kHz</i>  200 V to 1 kV <i>55 Hz to 1 kHz</i> <i>1 kHz to 10 kHz</i>	0.018 % + 4.7 $\mu$ V 0.019 % + 4.7 $\mu$ V  0.015 % + 24 $\mu$ V 0.015 % + 24 $\mu$ V  0.015 % + 240 $\mu$ V 0.015 % + 240 $\mu$ V  0.016 % + 2.3 mV 0.016 % + 2.3 mV  0.016 % + 23 mV 0.017 % + 23 mV	Measurement suitable for the calibration of sources	B
AC Current	10 $\mu$ A to 320 $\mu$ A <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 kHz</i>  320 $\mu$ A to 3.2 mA <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 kHz</i>  3.2 mA to 32 mA <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 Hz</i>  32 mA to 320 mA <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 kHz</i>  320 mA to 3.2 A <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 kHz</i>  3.2 A to 11 A <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 kHz</i>  11 A to 20 A <i>45 Hz to 1 kHz</i> <i>1 kHz to 5 kHz</i>	0.15 % + 120 nA 0.36 % + 180 nA  0.12 % + 180 nA 0.23 % + 240 nA  0.049 % + 2.4 $\mu$ A 0.095 % + 2.4 $\mu$ A  0.049 % + 24 $\mu$ A 0.12 % + 58 $\mu$ A  0.065 % + 120 $\mu$ A 0.70 % + 1.2 mA  0.12 % + 2.4 mA 3.5 % + 2.4 mA  0.18 % + 5.8 mA 3.0 % + 5.8 mA	Source values for the calibration of measuring instruments	B



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code		
AC Current	10 $\mu$ A to 320 $\mu$ A 45 Hz to 1 kHz 1 kHz to 5 kHz	0.15 % + 120 nA 0.36 % + 180 nA	Source values for the calibration of measuring instruments	B		
	320 $\mu$ A to 3.2 mA 45 Hz to 1 kHz 1 kHz to 5 kHz	0.12 % + 180 nA 0.23 % + 240 nA				
	3.2 mA to 32 mA 45 Hz to 1 kHz 1 kHz to 5 Hz	0.049 % + 2.4 $\mu$ A 0.095 % + 2.4 $\mu$ A				
	32 mA to 320 mA 45 Hz to 1 kHz 1 kHz to 5 kHz	0.049 % + 24 $\mu$ A 0.12 % + 58 $\mu$ A				
	320 mA to 3.2 A 45 Hz to 1 kHz 1 kHz to 5 kHz	0.065 % + 120 $\mu$ A 0.70 % + 1.2 mA				
	3.2 A to 11 A 45 Hz to 1 kHz 1 kHz to 5 kHz	0.12 % + 2.4 mA 3.5 % + 2.4 mA				
	11 A to 20 A 45 Hz to 1 kHz 1 kHz to 5 kHz	0.18 % + 5.8 mA 3.0 % + 5.8 mA				
	10 A to 100 A 45 Hz to 1 kHz	0.36 %			For the calibration of clamp meters only.	B
	100 A to 550 A 45 Hz to 1 kHz	0.38 %			For the calibration of clamp meters only.	
	100 A to 1000 A 45 Hz to 1 kHz	0.40 %			For the calibration of clamp meters only.	
	10 $\mu$ A to 200 $\mu$ A 55 Hz to 1 kHz 1 kHz to 5 kHz	0.060 % + 24 nA 0.061 % + 24 nA				
	200 $\mu$ A to 2 mA 55 Hz to 1 kHz 1 kHz to 5 kHz	0.037 % + 240 nA 0.037 % + 240 nA				
	2 mA to 20 mA 55 Hz to 1 kHz 1 kHz to 5 kHz	0.036 % + 2.4 $\mu$ A 0.036 % + 2.4 $\mu$ A				





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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
AC current - continued	20 mA to 200 mA 55 Hz to 1 kHz 1 kHz to 5 kHz  200 mA to 2 A 55 Hz to 1 kHz 1 kHz to 5 kHz  2 A to 20 A 55 Hz to 1 kHz 1 kHz to 5 kHz	0.035 % + 24 µA 0.035 % + 24 µA  0.073 % + 240 µA 0.087 % + 240 µA  0.10 % + 2.4 mA 0.30 % + 2.4 mA	Measurement suitable for the calibration of sources	B
AC Resistance	40 Hz to 400 Hz 1 mΩ to 10 mΩ 10 mΩ to 100 mΩ 100 mΩ to 1 Ω 1 Ω to 10 Ω 10 Ω to 100 Ω	0.080 % 0.071 % 0.071 % 0.086 % 0.051 %	Excitation current - 10 A: 1 mΩ to 20 mΩ 1 A: 20 mΩ to 2 Ω  100 mA: 2 Ω to 20 Ω 10 mA: 20 Ω to 200 Ω 1 mA: 200 Ω to 2 kΩ	B
Oscilloscopes				
Vertical deflection coefficients:	1 kHz 5 mV to 100 mV 100 mV to 100 V	0.17 % + 47 µV 0.12 % + 47 µV		B
Horizontal deflection coefficients:	2 ns to 20 ms 20 ms to 5 s	3.9 µs/s 0.59 %		
Vertical deflection coefficients:	1 kHz 5 mV to 100 mV 100 mV to 100 V	0.32 % + 120 µV 0.30 % + 120 µV		C
Horizontal deflection coefficients:	2 ns to 50 µs 50 µs to 5 s	30 µs/s 0.59 %		
Power Meters				
DC Power	1 W to 20 kW	0.16 %	At unity power factor only. Voltages will be in the range 10 V to 1000 V and currents will be in the range 100 mA to 20 A	B
AC Power 45Hz to 1 kHz	1 W to 20 kW	0.28 %		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Power Meters continued DC Power With Clamp AC Power With Clamp (45Hz to 1 kHz)	20 kW to 100 kW 20 kW to 100 kW	0.31 % 0.46 %	For use with Power meters with clamp head	B
DC Voltage	0 mV to 320 mV 320 mV to 3.2 V 3.2 V to 32 V 32 V to 320 V 320 V to 1020 V  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	0.0071 % + 3.7 μV 0.0059 % + 5.9 μV 0.0059 % + 60 μV 0.0065 % + 600 μV 0.0065 % + 2.0 mV  0.00080 % + 1.2 μV 0.00050 % + 1.3 μV 0.00050 % + 4.8 μV 0.00070 % + 47 μV 0.00070 % + 0.60 mV	Source values for the calibration of measuring instruments  Measurement suitable for the calibration of sources	A,C  A,C
DC Current	0 μA to 3.2 mA 3.2 mA to 32 mA 32 mA to 320 mA 320 mA to 1.1 A 1.1 A to 11 A  10 A to 100 A 100 A to 550 A  0 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 2 A 2 A to 20 A	0.015 % + 60 nA 0.012 % + 300 nA 0.012 % + 4.0 μA 0.035 % + 44 μA 0.071 % + 400 μA  0.26 % + 0.24 A 0.28 % + 0.24 A  0.0039 % + 0.5 nA 0.0017 % + 5.0 nA 0.0018 % + 50 nA 0.0057 % + 1.0 μA 0.022 % + 19 μA 0.047 % + 0.50 mA	Source values for the calibration of measuring instruments  Measurement suitable for the calibration of sources	A,C  A,C  A,C



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
DC Resistance	0 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 32 Ω 32 Ω to 100 Ω 100 Ω to 320 Ω 320 Ω to 1 kΩ	7.0 mΩ 0.015 % + 7.0 mΩ 0.014 % + 11.6 mΩ 0.011 % + 11.6 mΩ 0.011 % + 11.6 mΩ 0.011 % + 70 mΩ	Source values for the calibration of measuring instruments	A,C
	1 kΩ to 3.2 kΩ 3.2 kΩ to 10 kΩ 10 kΩ to 32 kΩ 32 kΩ to 100 kΩ 100 kΩ to 320 kΩ 320 kΩ to 1 MΩ	0.011 % + 70 mΩ 0.011 % + 700 mΩ 0.011 % + 700 mΩ 0.012 % + 7.0 Ω 0.014 % + 7.0 Ω 0.018 % + 64 Ω		
DC Resistance	1 MΩ to 3.2 MΩ 3.2 MΩ to 10 MΩ 10 MΩ to 32 MΩ 32 MΩ to 100 MΩ 100 MΩ to 320 MΩ	0.018 % + 64 Ω 0.069 % + 640 Ω 0.12 % + 0.86 kΩ 0.58 % + 8.6 kΩ 0.58 % + 61 kΩ	Measurement suitable for the calibration of sources	A,C
	0 Ω to 1 Ω 1 Ω to 10 Ω 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 100 MΩ to 1 GΩ	32 μΩ 0.0012 % + 29 μΩ 0.0010 % + 63 μΩ 0.0010 % + 580 μΩ 0.0010 % + 6.0 mΩ 0.0010 % + 58 mΩ 0.0012 % + 2.0 Ω 0.0027 % + 120 Ω 0.015 % + 12 kΩ 0.18 % + 1.2 MΩ		
Temperature indicators, calibration by electrical simulation				A,B,C
Base metal thermocouple Noble metal thermocouple	- 200 °C to + 1600 °C - 200 °C to + 1760 °C	0.20 °C 0.70 °C	Including cold junction compensation.	A,B,C
Base metal thermocouple Noble metal thermocouple	- 200 °C to + 1600 °C - 200 °C to + 1760 °C	0.20 °C 0.70 °C	Excluding cold junction compensation.	
Cold junction compensation	0 °C to 50 °C	0.10 °C	This is a supplementary measurement for monitoring temperature in air.	A,B,C
Resistance sensors	- 200 °C to 0 °C 0 ° to 850 °C	0.150 °C 0.050 °C		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
Frequency	10 MHz 1 Hz to 1.35 GHz	1.2 in 10 <sup>11</sup> 21 in 10 <sup>8</sup>		A,B,C
Time Interval	0 s to 60 min 0 s to 60 min	0.060 s 0.080 s		B A,C
Tachometers (Optical)	60 rpm to 90000 rpm 60 rpm to 90000 rpm	0.020 rpm 0.20 rpm	This is for devices with a resolution of 0.01 RPM	B A,C
<b>ADDITIONAL MEASUREMENTS SPECIFIC TO 17<sup>TH</sup> EDITION EQUIPMENT</b>				
Continuity	0 Ω to 20 Ω 100 Ω 1 kΩ	3.0 % + 1.2 mΩ 0.40 % + 6.3 mΩ 0.40 % + 18.2 mΩ		A,B,C
Continuity Current	0 to 320 mA	5.1 mA		
Insulation	1 MΩ 2 MΩ 3 MΩ 4 MΩ 5 MΩ 6 MΩ 7 MΩ 8 MΩ 9 MΩ 10 MΩ 20 MΩ 30 MΩ 40 MΩ 50 MΩ 60 MΩ 70 MΩ 80 MΩ  90 MΩ 100 MΩ 200 MΩ 400 MΩ 600 MΩ 800 MΩ  1 GΩ 2 GΩ 4 GΩ 6 GΩ 8 GΩ 10 GΩ	1.8 kΩ 2.7 kΩ 3.8 kΩ 4.9 kΩ 6.0 kΩ 71 kΩ 82 kΩ 94 kΩ 110 kΩ 120 kΩ 240 kΩ 360 kΩ 470 kΩ 587 kΩ 710 kΩ 830 kΩ 940 kΩ  1.1 MΩ 1.3 MΩ 2.9 MΩ 5.7 MΩ 8.6 MΩ 11 MΩ  14 MΩ 25 MΩ 240 MΩ 360 MΩ 470 MΩ 590 MΩ		A,B,C



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ADDITIONAL MEASUREMENTS SPECIFIC TO 17 <sup>TH</sup> EDITION EQUIPMENT continued				A,B,C
Insulation Test Voltage	50 VDC 100 VDC 250 VDC 500 VDC 1000 VDC	1.4 V 1.7 V 3.2 V 6.0 V 12 V		
Loop Impedance (50 Hz)	50 mΩ 100 mΩ 220 mΩ 330 mΩ 500 mΩ 1.0 Ω 5.0 Ω 10 Ω 100 Ω 1 kΩ	5.1 mΩ 5.1 mΩ 5.2 mΩ 5.5 mΩ 5.9 mΩ 8.0 mΩ 30 mΩ 60 mΩ 620 mΩ 6.0 Ω		A,B,C
PAT Load Test	0.13 kVA (nom 440 Ω)	28 Ω		A,B,C
PAT Leakage Current	2 mA 4.7 mA 7.7 mA	42 μA 85 μA 140 μA		
PAT Earth Bond Current	100 mA 10 A 25 A	8.5 mA 190 mA 450 mA		
PAT Earth Bond Resistance	0.05 Ω 0.1 Ω 0.22 Ω 0.33 Ω 0.5 Ω 1 Ω 5 Ω 10 Ω 100 Ω 1 kΩ	5.1 mΩ 5.0 mΩ 5.2 mΩ 5.4 mΩ 5.9 mΩ 8.0 mΩ 30 mΩ 60 mΩ 620 mΩ 6.3 Ω		
PAT Flash Voltage Class 1 Class 2	1.5 kV 3.0 kV	73 V 143 V		
PAT Flash Current	0 A to 1 mA 1 mA to 3 mA	64 μA 180 μA		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
ADDITIONAL MEASUREMENTS SPECIFIC TO 17 <sup>TH</sup> EDITION EQUIPMENT continued				
RCD Trip Current	3 to 10 mA 10.1 to 100 mA 101 mA to 1 A 1.01 A to 2 A	630 µA 5.9 mA 6.6 mA 120 mA		A,B,C
RCD Trip Time	20 m Sec 40 m Sec 100 m Sec 200 m Sec 390 m Sec 900 m Sec	0.70 m Sec 1.0 m Sec 1.5 m Sec 1.5 m Sec 1.5 m Sec 8.3 m Sec		A,B,C
TEMPERATURE			By comparison in a regulated heat source (block calibrator or Ice bath.)	
Resistance thermometers	-35 °C to 0 °C 0 °C 0 °C to 140 °C 140 °C to 185 °C 185 °C to 320 °C 320 °C to 420 °C	0.21 °C 0.035 °C 0.11 °C 0.21 °C 0.41 °C 0.61 °C		B
Thermocouples	-35 °C to 0 °C 0 °C to 140 °C 140 °C to 185 °C 185 °C to 320 °C 320 °C to 420 °C	0.44 °C 0.45 °C 0.50 °C 0.70 °C 0.90 °C		B
Temperature indicators with the following probe types				B
Resistance (eg Pt100)	-35 °C to 0 °C 0 °C 0 °C to 140 °C 140 °C to 185 °C 185 °C to 320 °C 320 °C to 420 °C	0.20 °C 0.022 °C 0.10 °C 0.20 °C 0.40 °C 0.60 °C		B
Thermocouple	-35 °C to 0 °C 0 °C to 140 °C 140 °C to 185 °C 185 °C to 320 °C 320 °C to 420 °C	0.44 °C 0.45 °C 0.50 °C 0.70 °C 0.90 °C		B



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
MASS				
Weights and artefacts	25 000 g 20 000 g 10 000 g 5 000 g 2 000 g 1 000 g 500 g 200 g 100 g 50 g 20 g 10 g 5 g 2 g 1 g 0.5 g 0.2 g 0.1 g 0.05 g 0.02 g 0.01 g 0.005 g 0.002 g 0.001 g	250 mg 200 mg 100 mg 50 mg 20 mg 10 mg 5 mg 2 mg 1 mg 0.6 mg 0.5 mg 0.4 mg 0.3 mg 0.24 mg 0.20 mg 0.16 mg 0.12 mg 0.10 mg 0.08 mg 0.06 mg 0.05 mg 0.04 mg 0.04 mg 0.04 mg	Notes  1. Calibrated using Borda substitution method.  2. Calibrations can be given in other units as required.  3. Intermediate values can be calibrated to an uncertainty interpolated from the next higher and lower values in the table.	A
NON AUTOMATIC WEIGHING MACHINES Lab & Site Electronic, single pan	200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 50 kg 100 kg 107 kg	0.03 mg 0.03 mg 0.04 mg 0.05 mg 0.06 mg 0.07 mg 0.10 mg 0.12 mg 0.18 mg 0.36 mg 0.90 mg 1.8 mg 7.2 mg 18 mg 36.1 mg 72.4 mg 1.8 g 2.5 g 2.6 g	Notes  1. Calibrated by comparison with reference standards  2. Weights are available in OIML Class:  E2 from 200 mg to 500 g, max. grouped load 1 kg  F1 from 1 g to 20 kg, max. grouped load 55 kg.  M1 from 5 kg to 20 kg, max. grouped load 107 kg  2. Other loads within the overall listed range may also be used	A, C



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
LENGTH				
Plain plug gauges (parallel)	1 to 25 diameter 25 to 100 diameter	0.80 1.0	By comparison with reference end standards	B
Plain ring gauges (parallel)	2 to 25 diameter 25 to 100 diameter	1.1 1.3		B
Length gauges, flat and spherical ended	0 to 175	1.5 + (5.0 x length in m)		B
MEASURING INSTRUMENTS AND MACHINES				
Micrometers External	BS 870:2008 0 to 200	Heads: 2.0 between any two points		B
Depth	BS6468:2008 0 to 150	Setting and extension rods 1.3 + (5.0 x length in m)		B
Vernier, digital electronic, dial caliper and height gauges	BS 887:2008 0 to 300	10 + (30 x length in m)		B
	BS 1643:2008 0 to 600	10 + (30 x length in m)		B
Calipers (see note 6)	ISO 13385-1 2019 Partial surface contact error (E) 0 to 600 mm	4.0		B
	Shift error (S) internal jaws 3 to 50 mm	4.0		
	Shift error (S) depth and step 3 to 50 mm	4.0		
Dial gauges and dial test indicators	BS 907:2008 and BS 2795:1981 0 to 25	1.5		B





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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks	Location Code
GLOSS	Geometry 20°		By comparison with reference gloss standards	D
	0 to 10 GU	0.62 GU		
	10 to 70 GU	0.60 GU		
	70 to 125 GU	0.98 GU		D
	1800 to 2000 GU	21.86 GU		
	Geometry 60°			
	0 to 10 GU	0.66 GU		D
	10 to 70 GU	1.05 GU		
	70 to 125 GU	0.88 GU		
800 to 1000 GU	11.23 GU	D		
Geometry 85°				
10 to 70 GU	1.02 GU			
70 to 125 GU	0.83 GU			
125 to 150 GU	3.76 GU			
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:  $Q[a, b] = [a^2 + b^2]^{1/2}$