


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

	Micron Metrology 2000 Limited	
	Issue No: 011	Issue date: 16 August 2005
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SUMMARY OF ACCREDITATION

Calibration performed on permanent laboratory premises

DIMENSIONAL

Angle plates, box angle plate
Balls
Bench centres
Comparators
Cylindrical setting standards
Dial gauges, lever
Dial gauges, plunger
Feeler gauges
Gauge blocks (by comparison)
Length gauges, flat & spherical ended
Levels, electronic
Levels, spirit
Luer gauges
Micrometer heads
Micrometers, 3 point bore
Micrometers, bench
Micrometers, depth
Micrometers, external
Micrometers, height setting
Micrometers, height setting riser blocks
Micrometers, internal
Micrometers, wedge
Orifice plates
Parallels, engineers
Penetration needles and cones
Plain gap gauges, parallel
Plain plug gauges, parallel
Plain plug gauges, taper
Plain ring gauges, parallel
Plain ring gauges, taper
Plain setting rings, parallel
Profile projectors
Protractors, bevel
Receiver & position gauges, jigs, fixtures
Roundness
Screw caliper gauges, parallel
Screw plug gauges, parallel
Screw plug gauges, taper
Screw ring gauges, parallel
Screw ring gauges, taper
Sine bars, centres, tables
Sine tables, compound
Squares, blade
Squares, block
Squares, cylindrical
Steel rules, engineers

Straightedges

Surface plates & tables
Surface texture
Thread annular vee setting standards
Thread diameter measuring machines
Thread measuring cylinders
Thread measuring styli
Thread measuring vee pieces (prisms)
Thread vee grooved jaw blades
Thread vee-grooved and plain end pieces
Vee blocks
Vernier gauges, caliper
Vernier gauges, depth
Vernier gauges, height

ELECTRICAL

Ammeters, ac
Ammeters, dc
Bridges and similar instruments, resistance
Calibrators, multimeter
Calibrators, temperature simulation
Frequency counters
Loop testers
Multimeters, analogue
Multimeters, digital
Oscilloscopes, deflection coefficients only
Portable appliance testers
Power supply units
Resistance boxes
Resistance thermometer indicators, electrical calibration
Resistance meters
Resistors, ac
Resistors, dc
Shunts
Thermocouple indicators, electrical calibration
Timers
Voltage dividers and volt ratio boxes, dc
Voltage standards, ac
Voltage standards dc
Voltmeters, ac
Voltmeters, dc

TORQUE

Hand torque (tools)

MASS

Weighing machines (non-automatic)



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DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Best Measurement Capability Expressed as an Expanded Uncertainty (<i>k</i> =2)	Remarks																			
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED																						
LENGTH			NOTES																			
Gauge blocks		Class (see footnote)	<p>Class C 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 represent the best capability for all grades of used gauges to BS 4311:Part 3:1993.</p> <p>Class D and E uncertainties are the maximum applicable to the measurement of length of steel and tungsten carbide grade 3 and 4 gauges respectively to BS 4311:Part 3:1993, by comparison with grade K standards of length of a similar material.</p> <p>Class D uncertainties also 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>1 All calibrations must be carried out in accordance with procedures agreed by UKAS.</p> <p>2 In addition to specified items, other similar items, including parts of measuring instruments and machines, may be calibrated (See Note 1) to the uncertainties stated. Where the item or part calibrated is of lower quality due to wear, errors in geometry or form, poor surface texture, or where any other factor that adversely affects the measurement capability, greater uncertainties must be quoted.</p> <p>3 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.</p>																			
Inch (Steel and tungsten carbide)	As BS 4311:Part 3:1993 Up to 0.4 in Above 0.4 in up to 1 in Size 2 in 3 in 4 in	<table border="0"> <tr><td>C</td><td>D</td><td>E</td><td rowspan="7">} μ inches</td></tr> <tr><td>3</td><td>4</td><td>6</td></tr> <tr><td>4</td><td>5</td><td>8</td></tr> <tr><td>5</td><td>7</td><td>10</td></tr> <tr><td>6</td><td>8</td><td>12</td></tr> <tr><td>7</td><td>10</td><td>14</td></tr> </table>		C	D	E	} μ inches	3	4	6	4	5	8	5	7	10	6	8	12	7	10	14
C	D	E		} μ inches																		
3	4	6																				
4	5	8																				
5	7	10																				
6	8	12																				
7	10	14																				
Millimetre (Steel and tungsten carbide)	As BS 4311:Part 3:1993 Up to 10 Above 10 up to 25 Size 30, 40, 50 60, 70, 75 80, 90, 100	<table border="0"> <tr><td>C</td><td>D</td><td>E</td></tr> <tr><td>0.08</td><td>.10</td><td>.15</td></tr> <tr><td>0.1</td><td>.13</td><td>.20</td></tr> <tr><td>0.12</td><td>.17</td><td>.25</td></tr> <tr><td>0.15</td><td>.21</td><td>.30</td></tr> <tr><td>0.18</td><td>.25</td><td>.35</td></tr> </table>			C	D	E	0.08	.10	.15	0.1	.13	.20	0.12	.17	.25	0.15	.21	.30	0.18	.25	.35
C	D	E																				
0.08	.10	.15																				
0.1	.13	.20																				
0.12	.17	.25																				
0.15	.21	.30																				
0.18	.25	.35																				
Thread measuring cylinders	BS 5590 and specials	0.5																				
Plain plug gauges (parallel) cylindrical setting standards and rollers	From 1 up to 25 diameter Above 25 up to 100 diameter Above 100 up to 150 diameter Above 150 up to 200 diameter Above 200 up to 300 diameter Above 300 up to 600 diameter	<table border="0"> <tr><td>0.5</td><td rowspan="7">} on diameter</td></tr> <tr><td>0.8</td></tr> <tr><td>1.2</td></tr> <tr><td>1.5</td></tr> <tr><td>2</td></tr> <tr><td>4</td></tr> </table>	0.5	} on diameter	0.8	1.2	1.5	2	4													
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Plain plug gauges (taper)																						
Taper up to 1 in 8 on diameter	From 3 up to 50 diameter Above 50 up to 100 diameter Above 100 up to 200 diameter Above 200 up to 300 diameter	<table border="0"> <tr><td>3</td><td rowspan="4">} on diameter</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> </table>	3	} on diameter	4	5	6															
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Taper above 1 in 8 and up to 1 in 3 on diameter	From 3 up to 50 diameter Above 50 up to 100 diameter Above 100 up to 200 diameter Above 200 up to 300 diameter	<table border="0"> <tr><td>5</td><td rowspan="4">} on diameter</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> <tr><td>8</td></tr> </table>	5	} on diameter	6	7	8															
5	} on diameter																					
6																						
7																						
8																						
Plain ring gauges (parallel) and setting standards	From 2 up to 25 diameter Above 25 up to 100 diameter Above 100 up to 150 diameter Above 150 up to 200 diameter Above 200 up to 400 diameter Above 400 up to 600 diameter	<table border="0"> <tr><td>0.8</td><td rowspan="6">} on diameter</td></tr> <tr><td>1</td></tr> <tr><td>2</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>6</td></tr> </table>	0.8	} on diameter	1	2	3	4	6													
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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED			
LENGTH (cont'd)			NOTES (cont'd)
Plain ring gauges (taper)			4 The uncertainty quoted is for the application of the calibration torque and does not take into account the characteristics of the device being calibrated.
Taper up to 1 in 8 on diameter	From 2 up to 50 diameter Above 50 up to 100 diameter Above 100 up to 150 diameter Above 150 up to 200 diameter	4 5 6 7 on diameter	5 Calibrations may also be given in lbf.in and lbf.ft.
Taper above 1 in 8 and up to 1 in 3 on diameter	From 2 up to 50 diameter Above 50 up to 100 diameter Above 100 up to 150 diameter Above 150 up to 200 diameter	6 7 8 9	6. Single start, symmetrical thread forms only.
Length gauges, flat and spherical ended	Up to 600	1 + (5 x length in m)	7. Single and multi-start symmetrical and asymmetrical thread forms.
Plain gap gauges (parallel)	From 0.5 up to 100 Above 100 up to 200 Above 200 up to 300	3 5 8	
Receiver, position and profile gauges, jigs, fixtures	Up to 400 x 200 x 200	Dependant on size and features Minimum per coordinate: 3 + (10 x length in m)	
Parallels	As BS 906	Dependant on size and grade From 1.5 up to 5	
Vee blocks	As BS 3731 up to 150	Dependant on size and grade From 2.5 up to 5	
Screw plug gauges (parallel) including check and setting plugs See Note 7	From 1 up to 100 diameter Above 100 up to 300 Above 300 up to 600	3 5 8 on pitch diameter	pitch: 1.5
Screw plug gauges (taper) including check plugs See Note 6	From 2 up to 100 Above 100 up to 300 Above 300 up to 500	5 8 10	flank angle: 2+(800/MxP)
Screw ring gauges (parallel) See Note 7	From 1 up to 2.5 diameter	By check plugs	Minutes of arc
	From 2.5 up to 100 diameter Above 100 up to 150 Above 150 up to 200 Above 200 up to 300 Above 300 up to 600	5 6 7 8 12 on pitch diameter	Where M is projector magnification and P is pitch in mm
Screw ring gauges (tapered) See Note 6	From 6 up to 100 diameter Above 100 up to 200 Above 200 up to 400 Above 400 up to 600	7 10 13 16	



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED			
LENGTH (cont'd)			
Screw thread adjustable caliper gauges (parallel) See Note 7	From 1 up to 200 diameter	By setting plugs	
Vee grooved jaw blades	Down to 0.6 (40 tpi)	3	
Annular vee grooved standards: External		3	
Internal		4	
Vee grooved end pieces		3	
Plain end pieces		0.5 on flatness	
Thread Stylii		0.1 on form	
Thread measuring vee pieces (prisms)	As NPL Schedule MOY/SCM1/60	Within schedule requirements	
Orifice plates	BS EN ISO 5167-1:1991	Dependant upon size	
Penetration needles and cones	Needles to BS 2000:Part 49:1993 Cones to BS 2000:Part 50:1993	3 on diameter Mass 5 mg	
ANGLE			
Squares			
Blade type	As BS 939 up to 300 Above 300 up to 600 Above 600 up to 1000	3 5 8	
Cylindrical	As BS 939 up to 300 Above 300 up to 600 Above 600 up to 1000	2 4 7	On squareness See Note 3
Block	As BS 939 up to 350 Above 300 up to 600 Above 600 up to 1000	3 5 8	
Angle plates and box angle plates	As BS 5535	Squareness: 3 + (1 per 100 mm) Parallelism: 1 + (1 per 100 mm) See Note 3	
Sine bars and tables	As BS 3064 and up to 500	Linear dimensions: 1 + (10 x length in m) Overall performance: 3 seconds of arc	
Sine centres	Up to 500 length or between centres	Linear dimensions: 1 + (10 x length in m)	
Compound sine tables	With tables or equivalent up to 500 length	Overall performance: 3 seconds or arc	



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FORM			
Roundness External Internal	Up to 350 diameter From 5 up to 350 diameter	0.05 on radius	
Straightedges Cast iron Steel Granite	As BS 5204:Part 1 and above As BS 5204:Part 2 and above	1 + (2 x length in m) See Note 3	
Precision balls: Steel and Tungsten Carbide	From 1 up to 30	0.8 on diameter	
Surface plates Granite	As BS 817 Up to 2500 x 1600	1.5 + (0.8 x diagonal in m) See Note 3	
Surface texture	As BS 1134	7% of measured value	
MEASURING INSTRUMENTS AND MACHINES			
Micrometers External Internal Depth	As BS 870 and above As BS 959 As BS 6468	Heads:2.0 between any two points Setting and extension rods 1 + (5 x length in m)	
3 point bore	Up to 150 Above 150 up to 250	5 8	
Micrometer heads	As BS 1734	1.0	
Bench micrometer		Overall performance 2.0	
Vernier caliper, height and depth gauges	As BS 887 and BS 1643	Overall performance 10 + (30 x length in m)	
Dial gauges and dial test indicators	As BS 907 and BS 2795	1.0	
Height setting micrometer	Up to 300	Heads 1.0 Overall performance 3.0	
Riser blocks for above	150 300	2.5 5.0	
Bench centres	Up to 1 m between centres	Linear dimensions 1 + (10 x length in m)	
Thread diameter measuring	As NPL Schedules MOY/SCM1/9 and MOY/SCM1/12 up to 300	Overall performance 1.5	



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MEASURING INSTRUMENTS AND MACHINES (Cont'd)			
Profile projectors	Up to 100 magnifications	Dependent on quality and overall performance	
Bevel protractors	As BS 1685	1 min of arc + 1 vernier division	
Comparators (external)	As BS 1054 up to 10 000 magnifications	1% or range Minimum 0.2	
Co-ordinate tables	Up to 500 square with 150 movement	Overall performance 3	
Spirit levels	As BS 3509 and BS 958	Mean sensitivity 10% of nominal Minimum 0.5 seconds of arc	
Electronic indicating levels	Up to 20 minutes of arc	1.0% or range Minimum 0.5 seconds of arc	
Luer (taper) gauges	As BS 3930:Part 1:1987 and BS 3930:Part 2:1991	As per plain taper and screw taper gauges above	
NPL type Wedge Micrometer	As MOY/SMI/89	0.3	
Steel Rules	As BS 4372:1968	15 + (20 x L in m)	
Feeler gauges	As BS 3957:Part 1:1941 and BS 3957:Part 2:1969	3	
TORQUE			
Hand torque tools	To BS EN 6789:2003 1 N.m to 1000 N.m	1.0% See Notes 4 and 5	
ELECTRICAL			
DC VOLTAGE			
Up to 200 mV		15 ppm + 0.5 μ V	
200 mV to 2 V		16 ppm	
2 V to 20 V		11 ppm	
20 V to 200 V		14 ppm	
200 V to 1 kV		19 ppm	



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RESISTANCE Specific Values			
1 Ω		0.021%	
10 Ω		0.013%	
100 Ω		38 ppm	
1 kΩ		41 ppm	
10 kΩ		0.011%	
100 kΩ		85 ppm	
1 MΩ		90 ppm	
10 MΩ		0.017%	
Other values			
Up to 20 Ω		0.024% + 20 μΩ	
20 Ω to 200 Ω		0.015%	
200 Ω to 2 kΩ		0.002%	
2 kΩ to 20 kΩ		0.002%	
20 kΩ to 200 kΩ		0.003%	
200 kΩ to 2 MΩ		0.025%	
2 MΩ to 20 MΩ		0.025%	
AC Resistance			
1 mΩ to 10 mΩ	50 Hz to 1 kHz	0.11%	
10 mΩ to 1Ω	50 Hz to 1 kHz	0.098%	
1 Ω to 10 Ω	50 Hz to 1 kHz	0.048%	
10 Ω to 100 Ω	50 Hz to 1 kHz	0.057%	
DC CURRENT Range Values			
Up to 200 μA		80 ppm + 5 nA	
200 μA to 2 mA		80 ppm	
2 mA to 20 mA		130 ppm	
20 mA to 200 mA		130 ppm	
200 mA to 2 A		270 ppm	
2 A to 20 A		150 ppm + 1 mA	Generate only
AC VOLTAGE Specific Values			
10 mV to 200 mV	40 Hz to 2 kHz 2 kHz to 10 kHz	0.039% 0.049%	
200 mV to 2 V	40 Hz to 2 kHz 2 kHz to 10 kHz	0.039% 0.049%	
2 V to 20 V	40 Hz to 2 kHz 2 kHz to 10 kHz	0.031% 0.025%	
20 V to 200 V	40 Hz to 2 kHz 2 kHz to 10 kHz	0.031% 0.025%	
200 V to 1 kV	55 Hz to 1 kHz	0.030%	



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AC CURRENT 10 μ A to 200 mA 200 mA to 2 A 2 A to 20 A	60 Hz to 1 kHz 55 Hz to 1 kHz 40 Hz to 3 kHz	0.041% 0.090% 0.2% + 5 mA	Generate only
FREQUENCY	1 Hz to 100 MHz	2 parts in 10^{-8}	
TEMPERATURE SIMULATION Reference junction temperature for electrical simulation	0°C to 50°	1°C	This is a supplementary measurement for monitoring temperature in air.
Thermocouple indicator type:			
K	-140 °C to 1350 °C	0.8°C	
J	-200 °C to 1200 °C	0.8°C	
T	-270 °C to 400 °C	0.8°C	
R	-50 °C to 1760 °C	0.8°C	
Resistance	Up to 400 Ω 400 Ω to 4 k Ω	0.81% 0.058%	
OSCILLOSCOPES Vertical deflection coefficients:			
	1 kHz 5 mV to 50 mV 50 mV to 120 V	1.2% 0.4%	Square-wave signals appropriate for the calibration of oscilloscope vertical deflection coefficients
Horizontal deflection coefficients:			
	5 s/div to 5 ns/div	0.4%	Pulse markers appropriate for the calibration of oscilloscope horizontal deflection coefficients The uncertainties quoted above are based on the screen resolution of typical oscilloscopes. The uncertainties may be increased if the oscilloscope undergoing calibration does not display these typical characteristics.
NON-AUTOMATIC WEIGHING MACHINES (with digital indicators)	Up to 107 kg	Uncertainties quoted will depend on the performance of the weighing machine under calibration, and will not be less than the uncertainty of calibration of the weights used for the calibration	Weights are available in OIML Class E2 from 1 mg to 500 g, Class F1 1 g to 20 kg (total 35 kg) and Class M1, 2 x 20 kg, 2 x 10 kg 1 x 5 kg

END