


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>0785</p> <p>Accredited to ISO/IEC 17025:2005</p>	<p>Trescal EMS</p> <p>A trading division of Trescal Ltd</p> <p>Issue No: 023 Issue date: 04 April 2018</p>	
	<p>Leigh Commerce Park Greenfold Way Leigh Greater Manchester WN7 3XJ</p>	<p>Contact: Mr K Angus & Mr D Moore Tel: + 44 (0)1942 761226 E-Mail: kyle.angus@trescal.com Website: www.trescal.com</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>Address United Technologies Corporation Stafford Road Fordhouses Wolverhampton West Midlands WV10 7EH</p>	<p>Local contact Kyle Angus or Dave Moore Tel +44 (0) 1902 624 644 Fax +44 (0) 1902 624 463 Email: kyle.angus@trescal.com</p>	<p>Capabilities: Electrical DC and LF Dimensional</p>	Wolverhampton
<p>Address BAE Systems Warton Aerodrome Lytham Road Preston Lancashire PR4 1AX</p>	<p>Local contact Kyle Angus Tel +44 (0) 1942 761226 Fax Email: kyle.angus@trescal.com</p>	<p>Capabilities: Dimensional</p>	Warton
<p>Address Controls and Data Services c/o Rolls-Royce Derwent Building 5000 Solihull Parkway Birmingham Business Park Birmingham B37 7YP</p>	<p>Local contact Adrian Dyszkiewicz Tel +44 (0) 121 2732781 Fax Email: adrian.dyszkiewicz@rollsroyce.com</p>	<p>Capabilities: Electrical DC and LF</p>	Solihull
<p>Address Aero Engine Controls Standards/ Calibration Room Shaftmoor Lane Hall Green Birmingham B28 8SW</p>	<p>Local contact Jim Attwooll Tel +44 (0) 121 706 7395 / +44 (0) 121 707 7111 Ext 5809 Fax +44 (0) 121 707 8826 Email: jim.attwooll@rolls-royce.com</p>	<p>Capabilities: Dimensional</p>	Shaftmoor



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Location details	Activity	Location code
Address Airbus Broughton Building 10 Chester Road Broughton CH4 0DR Local contact Chris Evans Tel +44 (0) 1244 523920 Fax +44 (0) 1244 524189 Email: Chris.evans@trescal.com	Capabilities: Dimensional	Airbus Broughton
Address Cummins Engines Yarm Road Darlington DL1 4PW Local contact Steve Urwin Tel +44 (0) 1325 556382 Fax: Email: Steven.urwin@trescal.com	Capabilities: Dimensional	Cummins Darlington
Address Brook Road Wimborne BH21 2BJ Local contact Kyle Angus Tel +44 (0) 1942 761226 Fax Email: kyle.angus@trescal.com	Capabilities: Torque	Cobham Wimborne



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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	
RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED					
ELECTRICAL MEASUREMENTS					
DC RESISTANCE Measurement	0 Ω to 20 Ω 20 Ω to 200 Ω 200 Ω to 2 k Ω 2 k Ω to 20 k Ω 20 k Ω to 200 k Ω 200 k Ω to 2 M Ω 2 M Ω to 20 M Ω 20 M Ω to 200 M Ω 200 M Ω to 1 G Ω	28 ppm + 25 $\mu\Omega$ 16 ppm + 100 $\mu\Omega$ 13 ppm + 1.0 m Ω 13 ppm + 10 m Ω 16 ppm + 100 m Ω 27 ppm + 2.0 Ω 75 ppm + 100 Ω 500 ppm + 12 k Ω 1.0 % + 1.1 M Ω		Wolverhampton and Solihull	
DC VOLTAGE Measurement	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1 kV	11 ppm + 1.2 μ V 8.5 ppm + 0.9 μ V 8.5 ppm + 4.0 μ V 13 ppm + 60 μ V 13 ppm + 600 μ V			
DC CURRENT Measurement	0 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	140 ppm + 0.60 nA 130 ppm + 6.0 nA 130 ppm + 60 nA 130 ppm + 1.3 μ A 240 ppm + 25 μ A			
	2 A to 10 A 10 A to 100 A	0.060 % 0.14 %			Wolverhampton only
AC VOLTAGE Measurement	10 mV to 200 mV 40 Hz to 10 kHz	320 ppm + 5.0 μ V			Wolverhampton and Solihull
	200 mV to 2 V 40 Hz to 10 kHz	210 ppm + 25 μ V			
	2 V to 20 V 40 Hz to 10 kHz	210 ppm + 250 μ V			
	20 V to 200 V 40 Hz to 10 kHz	210 ppm + 2.5 mV			



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
AC VOLTAGE Measurement continued	200 V to 1 kV 55 Hz to 1 kHz 1 kHz to 10 kHz	360 ppm + 50 mV 450 ppm + 50 mV		Wolverhampton and Solihull
AC CURRENT Measurement	10 μ A to 200 μ A 55 Hz to 1 kHz	600 ppm + 25 nA		
	200 μ A to 2 mA 55 Hz to 1 kHz	400 ppm + 250 nA		
	2 mA to 20 mA 55 Hz to 1 kHz	400 ppm + 2.5 μ A		
	20 mA to 200 mA 55 Hz to 1 kHz	400 ppm + 25 μ A		
	200 mA to 2 A 55 Hz to 1 kHz	900 ppm + 500 μ A		
DC RESISTANCE Generation	0 Ω 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	180 ppm + 11 m Ω 150 ppm + 19 m Ω 110 ppm + 19 m Ω 110 ppm + 19 m Ω 110 ppm + 90 m Ω 110 ppm + 90 m Ω 110 ppm + 900 m Ω 110 ppm + 900 m Ω 140 ppm + 9.0 Ω 150 ppm + 9.0 Ω 180 ppm + 80 Ω 200 ppm + 80 Ω 710 ppm + 800 Ω 0.14 % + 800 Ω 0.60 % + 8.0 k Ω 0.60 % + 21 k Ω		Wolverhampton only
DC VOLTAGE Generation	0 mV to 330 mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V 330 V to 1 kV	75 ppm + 6.0 μ V 60 ppm + 13 μ V 60 ppm + 130 μ V 70 ppm + 1.3 mV 70 ppm + 11 mV		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
DC CURRENT Generation	0 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA 330 mA to 2.2 A 2.2 A to 10 A 10 A to 100 A	160 ppm + 130 nA 130 ppm + 1.1 μ A 130 ppm + 12 μ A 370 ppm + 120 μ A 0.060 % 0.14 %		Wolverhampton only
AC VOLTAGE Generation	1 mV to 33 mV 45 Hz to 10 kHz 33 mV to 330 mV 45 Hz to 10 kHz 330 mV to 3.3 V 45 Hz to 10 kHz 3.3 V to 33 V 45 Hz to 10 kHz 33 V to 330 V 45 Hz to 1 kHz 1 kHz to 10 kHz 330 V to 1 kV 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	1650 ppm + 27 μ V 600 ppm + 29 μ V 360 ppm + 130 μ V 470 ppm + 1.3 mV 600 ppm + 14 mV 900 ppm + 22 mV 600 ppm + 150 mV 2100 ppm + 170 mV 2100 ppm + 600 mV		Wolverhampton only
AC CURRENT Generation	29 μ A to 0.33 mA 45 Hz to 1 kHz 0.33 mA to 3.3 mA 45 Hz to 1 kHz 3.3 mA to 33 mA 45 Hz to 1 kHz 33 mA to 330 mA 45 Hz to 1 kHz 330 mA to 2.2 A 45 Hz to 1 kHz	0.18 % + 320 nA 0.12 % + 380 nA 0.11 % + 3.8 μ A 0.11 % + 38 μ A 0.12 % + 380 μ A		Wolverhampton only



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AC CURRENT Generation continued	2.2 A to 11 A 45 Hz to 500 Hz 500 Hz to 1 kHz	0.13 % + 2.7 mA 0.38 % + 2.7 mA		Wolverhampton only
DC CONDUCTANCE	10 mS to 10 nS	1.0 %		
CAPACITANCE	10 μ F to 1 mF 100 Hz 10 pF to 1 μ F 1 kHz 100 pF to 1 μ F 10 kHz	1.5 % 0.060 % 0.080 %		
INDUCTANCE	10 μ H to 100 μ H 1 kHz 100 μ H to 10 H 1 kHz	0.50 % 0.10 %		Wolverhampton only
FREQUENCY	0.1 Hz to 1 Hz 1 Hz to 10 Hz 10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 10 MHz	20 μ Hz 20 ppm 2.0 ppm 0.20 ppm 3.0 parts in 10^8 2.0 parts in 10^8		
DC RESISTANCE Generation				Solihull
Specific Values	10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω	35 ppm 15 ppm 15 ppm 15 ppm 15 ppm 18 ppm 80 ppm 180 ppm		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
DC RESISTANCE Generation (Continued)				Softnull
Other Values	0 Ω 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	180 ppm + 11 m Ω 150 ppm + 19 m Ω 110 ppm + 19 m Ω 110 ppm + 19 m Ω 110 ppm + 90 m Ω 110 ppm + 90 m Ω 110 ppm + 900 m Ω 110 ppm + 900 m Ω 140 ppm + 9.0 Ω 150 ppm + 9.0 Ω 180 ppm + 80 Ω 200 ppm + 80 Ω 710 ppm + 800 Ω 0.14 % + 800 Ω 0.60 % + 8.0 k Ω 0.60 % + 21 k Ω		
DC VOLTAGE Generation	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1 kV	12 ppm + 1.0 μ V 7.5 ppm + 1.5 μ V 6.0 ppm + 5.0 μ V 8.0 ppm + 70 μ V 10 ppm + 700 μ V		
DC CURRENT Generation	0 μ A to 220 μ A 220 μ A to 2.2 mA 2.2 mA to 22 mA 22 mA to 220 mA 220 mA to 2.2 A 2.2 A to 11 A	70 ppm + 10 nA 60 ppm + 12 nA 60 ppm + 120 nA 70 ppm + 1.2 μ A 100 ppm + 35 μ A 710 ppm + 510 μ A		
AC VOLTAGE Generation	40 Hz to 10 kHz 0.22 mV to 2.2 mV 2.2 mV to 22 mV 22 mV to 220 mV 220 mV to 2.2 V 2.2 V to 22 V 22 V to 220 V 55 Hz to 1 kHz 220 V to 1 kV	700 ppm + 6.0 μ V 230 ppm + 7.0 μ V 140 ppm + 10 μ V 100 ppm + 14 μ V 100 ppm + 130 μ V 110 ppm + 1.5 mV 120 ppm + 8.0 mV		



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DIMENSIONAL MEASUREMENTS LENGTH NOTES 1. In addition to the items listed above, other similar items, including parts of measuring instruments and machines, may be calibrated to the uncertainties stated. Where the item or part calibrated is of lower quality due to wear, errors in geometry or form, or poor surface texture, or where any other factor adversely affects the measurement capability, greater uncertainties must be quoted. 2. The uncertainty quoted if for the departure from flatness, straightness, or squareness, i.e. the distance separating the two parallel planes, which just enclose the surface under consideration. 3. Single start, symmetrical thread forms only.				
Precision scales (linear)	0 to 400	1.5 + (3.0 x length in m)		Warton
Plain plug gauges (parallel) cylindrical setting standards and rollers	1 to 50 diameter 50 to 100 100 to 150	0.80 1.0 1.2		Wolverhampton and Warton
Plain ring gauges (parallel)	6 to 50 diameter 50 to 100 100 to 150	1.0 1.6 2.0		Wolverhampton and Warton
Screw plug gauges (parallel) including check and setting plugs See Note 3	3 to 100 diameter	3.0 on pitch diameter		Warton
Screw ring gauges (parallel) See Note 3	6 to 100 diameters	5.0 on pitch diameter		Warton
Pitch: 1.5 Flank angle: $2.0 + ((800/MxP))$ Minutes of arc Where M is the projector magnification and P is pitch in mm				
Parallels	As BS 906:1972	Dependent on size and grade 1.5 to 5.0		Wolverhampton and Warton
Vee blocks	As BS 3731:1987	Dependent on size and grade 2.5 to 5.0		Warton



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
ANGLE Squares Blade type Angle plates and box angle plates Sine bars and tables	As BS 939:2007 up to 300 300 up to 600 As BS 5535:1978 As BS 3064:1978 and up to 500 length	3.0 on squareness 5.0 See note 2 Squareness: 3.0 + (1.0 per 100 mm) Parallelism: 1.0+ (1.0 per 100 mm) See Note 2 Linear dimensions: 1.0 + (10 x length in m) Overall performance: 5.0 seconds of arc		Warton
FORM Surface plates Granite Cast iron	As BS 817:2008	1.5 + (0.80 x diagonal in m) See Note 2		
Roundness External Internal Straightedges Cast Iron Steel Granite	As BS 3730:1982 0 to 350 diameter 3 to 350 diameter As BS 5204:1975:Part 1 As BS 5204:1977:Part 2 As BS 5204:1977:Part 2	See Note 2 0.050 on radius 0.050 on radius 1.0 + (2 x length in m) See Note 2		
				Warton



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
MEASURING INSTRUMENTS AND MACHINES				
Micrometers				
External Internal Depth	As BS 870:2008 and above As BS 959:2008 As BS 6468:2008	Heads: 2.0 between any two points Setting and extension rods: $1.0 + 5.0 \times \text{length}$ in m	Note: Internal micrometers not covered at Shaftmoor or Airbus.	Wolverhampton, Airbus, Cummins, Warton and Shaftmoor
MEASURING INSTRUMENTS AND MACHINES (cont'd)				
Bore micrometers (3 point)	0 mm to 100mm	Overall performance 5.0		Wolverhampton, Airbus and Warton
Micrometer heads	As BS 1734:1951	1.0		Warton
Bench micrometer		Overall performance 2.0		
Height setting micrometer	0 to 300	Heads: 1.5 between any two points stepped column 2.5 Overall performance: 3.0		Wolverhampton and Warton
Riser blocks for above	150 300	2.5 5.0		
Electronic height gauges	1 to 600	$1.0 + (5.0 \times \text{length}$ in m)		Warton
Vernier gauges Caliper Height Depth	As BS 887:2008 As BS 1643:2008 As BS 6365:2008	Overall performance: $10 + (30 \times \text{length in}$ m)		Wolverhampton, Airbus, Cummins, Warton and Shaftmoor
Dial gauges and dial test indicators	As BS 907:2008 and BS 2795:1981	1.0		



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MEASURING INSTRUMENTS AND MACHINES (cont'd)				
Spirit levels	BS 958:1968 and BS 3509:1962	Mean sensitivity: 10 % of nominal Minimum 0.50 seconds of arc		Warton
Bevel protractors	As BS 1685:2008	1.0 min of arc + 1.0 vernier division		Wolverhampton and Warton
Steel rules	0 m to 1m	15 + (20 x length in metres)		Warton
FORM				
Surface Plates				Warton
NOTES				
1. The uncertainty quoted is for the departure from flatness, straightness or squareness; i.e. the distance separating the two parallel planes, which just enclose the surface under consideration.				
Granite Cast iron	As BS 817:2008	1.5 + (0.8 x diagonal in m) See Note 1		Warton
Electronic height gauges	1 mm to 600mm	1.0 + (5.0 x length in m)		Warton
TORQUE				
Hand torque tools	To BS EN ISO 6789:2003 (withdrawn and superseded) 0.2 N·m to 1500 N·m	1.6 %	The quoted uncertainty will be particularly dependent on the repeatability of the unit under test.	Wimbourne
END				