


Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

 <p>0394 Accredited to ISO/IEC 17025:2005</p>	<h3>Trescal EMS – Rolls Royce</h3> <p>Issue No: 033 Issue date: 13 March 2012</p>	
	<p>Standards Room Building 26 Ansty Coventry CV7 9JR</p>	<p>Contact: Mr R A Searle Tel: +44 (0)2476 623625 Fax: +44 (0)2476 623626 E-Mail: rich.searle@rolls-royce.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 (Ansty) Trescal EMS – Rolls Royce Standards Room Building 26 Ansty Coventry CV7 9JR</p> <p>Local contact Mr R Searle / Mr R Ireland Tel: +44 (0) 2476 623625 Fax: +44 (0) 2476 623626 Email: rich.searle@rolls-royce.com</p>	<p><u>Dimensional</u> <u>Electrical</u> <u>Pressure</u> <u>Temperature</u> <u>Torque</u></p>	Ansty
<p>Address (Derby Rotatives) Trescal EMS – Rolls Royce Sinfin Lane Derby DE24 9GJ</p> <p>Local contact Mr R Parker Tel: +44 (0) 1332 241024 Fax: +44 (0) 1332 241744 Email: richard.parker@trescal.com</p>	<p><u>Dimensional</u></p>	Derby Rotatives
<p>Address (Derby SinFin) Trescal EMS – Rolls Royce Victory Road Derby DE24 8BJ</p> <p>Local contact Mr A Smith./ Mr P Short Tel: +44 (0) 1332 247915 Fax: +44 (0) 1332 247193 Email: adrian.j.smith@rolls-royce.com</p>	<p><u>Electrical</u> <u>Humidity</u></p>	Sin Fin
<p>Address (East Kilbride) Trescal EMS – Rolls Royce Nerston Industrial Estate Mavor Avenue East Kilbride Glasgow G74 4PY</p> <p>Local contact Mr G Maxwell/Mr J Barclay Tel: +44 (0) 13552 277248 Fax: +44 (0) 13552 277617 Email: jim.barclay@rolls-royce.com</p>	<p><u>Dimensional</u></p>	East Kilbride



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Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
<p>Address (Sunderland) Trescal EMS – Rolls Royce Pallion Industrial Estate Sunderland SR4 6SS</p>	<p>Local contact Mr G Maxwell/Mr W Donkin Tel: +44 (0) 191 515050 Fax: +44 (0) 191 515024 Email: bill.donkin@rolls-royce.com</p>	<p><u>Dimensional</u></p>	Sunderland
<p>Address (Bristol) Trescal EMS – Rolls Royce Metrology Laboratory (EW6/7) PO Box 3 Filton Bristol BS34 7QE</p>	<p>Local contact Mr M Viney/Ms T Cogan Tel: +44 (0) 117 979 6099 Fax: +44 (0) 117 979 5038 Email: michael.viney@rolls-royce.com</p>	<p><u>Fuel Flow</u></p>	Bristol
<p>All Rolls Royce sites: The site or premises must be suitable for the nature of the particular calibrations undertaken and will be the subject of contract review arrangements between the laboratory and the customer.</p>	<p>Local contact Mr R Searle / Mr R Ireland Tel: +44 (0) 2476 623625 Fax: +44 (0) 2476 623626 Email: rich.searle@rolls-royce.com</p>	<p><u>Form</u> <u>Electrical</u></p>	Site



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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				
LENGTH				
Thread measuring cylinders	BS3777:1964 and BS 5590:1978 and specials 0.1 to 5.0 diameter	0.50 on diameter	NOTES 1 In addition to all items in the first column, other similar items, including parts of measuring instruments and machines, may be calibrated in accordance with the stated CMCs. 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 will be quoted. Note 2 Class C uncertainties apply to the measurement of length of gauges by comparison with grade K standards of length of a similar material. Class C uncertainties apply to new and used grade 0, 1 and 2 gauges to BS EN ISO 3650:1999 and BS 4311-1:2007.	
Plain plug gauges (parallel), cylindrical setting standards, gear measuring cylinders and rollers	1 to 50 diameter 50 to 100 100 to 150 150 to 200 200 to 300	0.50 0.80 1.0 on diameter 1.2 1.6		
Plain ring gauges (parallel) and setting standards	1 to 50 diameter 50 to 100 diameter 100 to 150 diameter 150 to 200 diameter	0.80 1.2 1.8 on diameter 2.5		
Length gauges, flat and spherical ended	0 m to 3 m	1.0 + (5.0 x length in m)		
Gauge blocks		Class (see notes)		
Inch (Steel)	BS 4311-1 :2007 0 in to 0.4 in 0.4 in to 1 in Size 2 in 3 in 4 in	C 3.0 μ in 4.0 μ in 5.0 μ in 6.0 μ in 7.0 μ in		
Millimetre (Steel)	BS EN ISO 3650:1999 0 to 10 10 to 25 Size 30, 40, 50 60, 70, 75 80, 90, 100	C 0.080 0.10 0.12 0.15 0.18		
Length bars Inspection and workshop grades 1 and 2	BS 1790:1961 BS 5317:1976	0.45 + (1.1 x length in m)		
Plain gap gauges (parallel)	BS 969:2008 0.5 to 100 100 to 200 200 to 300	3.0 5.0 8.0		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
Screw plug gauges (parallel) including check and setting plugs See Note 6	1 to 100 diameter 100 to 300 diameter	2.5) 5.0)) On pitch) diameter	Note 3 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.	
Screw ring gauges (parallel) See Note 5	5 to 75 diameter 100 to 150 diameter 150 to 300 diameter	4.0) 5.0) 8.0)		
Screw pitch	0.2 to 8	1.5	Note 4 All linear calibrations may be given in inch units.	
Screw flank angle	0 ° to 50 °	5.0 minutes of arc	Note 5 Single start symmetrical and asymmetrical thread forms only.	
Parallels	BS 906:Parts 1 & 2:1992 5 to 50 x 100 x 400	1.5 to 5.0	Note 6 Single and multi-start symmetrical and asymmetrical thread forms only.	
Vee blocks	BS 3731:1987 20 to 150 diameter, Vee capacity	2.5 to 5.0		
ANGLE				
Squares Blade type	BS 939:2007 50 to 300 300 to 600	3.0 5.0		
Cylindrical	BS 939:2007 75 to 300 300 to 600	2.0 On squares 4.0 See Note 3		
Block	BS 939:2007 50 to 300 300 to 600	3.0 5.0		
Angle gauges	NPL type Other types	2.0 seconds of arc 3.0 seconds of arc		
Sine bars and tables	BS 3064:1978 100 to 500 length	Linear dimensions: 1.0 + (10 x length in m) Overall performance:3.0 seconds of arc		
Sine centres	100 to 500 length or between centres	Linear dimensions: 1.0+ (10 x length in m) Overall performance 5.0 seconds of arc		
Compound sine tables	100 to 500 length			



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
FORM				
Straightedges Cast iron Steel Granite	BS 5204:Part 1:1975 0 m to 2m	1.0 + (2.0 x length in m) See Note 3		
Roundness External Internal	BS 3730:Part 2:1982 0 to 350 diameter 3 to 350 diameter	0.050 on radius		
Steel balls	1 to 25 diameter	0.50 on diameter		
MEASURING INSTRUMENTS AND MACHINES				
Micrometers				
External	BS 870:2008 0 to 300	Heads: 2.0		
Internal	BS 959:2008 0 to 300	Setting and		
Depth	BS 6468:2008 0 to 300	Extension rods: 1.0 + (5.0 x length in m)		
Micrometer heads	BS 1734:1951 0 to 100	1.0		
Bench micrometer	0 to 100	Overall performance 1.0		
Height setting micrometer	0 to 300	Heads 1.0 Stepped column 1.6 Overall performance 2.0		
Riser Blocks	150 300	1.0 2.0		
Vernier gauges				
Caliper Height	BS 887:2008 BS 1643:2008 0 to 1200	Overall performance: 10 + 30 x length in m		
Depth	BS 6365:2008 0 to 600			
Dial gauges and dial test indicators	BS 907:2008 and BS 2795:1981 0 to 50	1.0		



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MEASURING INSTRUMENTS AND MACHINES (cont'd)				
Dividing heads Rotary tables	100 to 750 capacity	Linear dimensions 1.0 + (10 x length in m) Overall angular performance 3.0 seconds of arc		
Spirit levels	BS 958:1968 and BS 3509:1962 Nominal sensitivity 5 seconds of arc to 60 minutes of arc	Mean sensitivity: 10 % of nominal Minimum 0.50 seconds of arc		
Clinometers	0 ° to 360 °	10 seconds of arc		
Levels, electronic	0 seconds of arc to 10 minutes of arc	1.0 % of range minimum 0.50 seconds of arc	The quoted uncertainty will be particularly dependent on the sensitivity of the device	
Orifice plates	BS EN ISO 5167-2:2003 Bore d diameter 12.5 mm to 1 m	4.0 + (6.0 x length in m)		
TORQUE				
Hand torque tools	To BS EN ISO 6789:2003 0.2 N m to 1000 N m	1.0 %	The quoted uncertainty will be particularly dependent on the repeatability of the unit under test.	
ELECTRICAL MEASUREMENTS				
DC VOLTAGE				
Reference values	1 V 1.018 V 10 V	0.75 ppm 0.80 ppm 0.49 ppm	Calibration of standard Cells	
Specific values	10 mV 100 mV 1 V	32 ppm 3.3 ppm 0.90 ppm		
	10 V 100 V 1 kV	0.50 ppm 0.67 ppm 1.9 ppm		



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ELECTRICAL MEASUREMENTS (cont'd)				
Other values	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V	0.47 μ V 1.9 ppm 0.91 ppm		
	20 V to 200 V 200 V to 1 kV	1.6 ppm 3.4 ppm		
DC RESISTANCE				
Specific Values	0.1 Ω 1 Ω 10 Ω	22 ppm 6.3 ppm 1.6 ppm		
	100 Ω 1 k Ω 10 k Ω	1.3 ppm 1.3 ppm 1.2 ppm		
	100 k Ω 1 M Ω 10 M Ω	2.5 ppm 5.6 ppm 15 ppm		
	100 M Ω 1 G Ω	36 ppm 0.13 %		
Other Values	0 Ω to 0.1 Ω 0.1 Ω to 0.2 Ω 0.2 Ω to 2 Ω	2.2 $\mu\Omega$ 30 ppm 28 ppm		
	2 Ω to 20 Ω 20 Ω to 200 Ω 200 Ω to 2 k Ω	11 ppm 4.5 ppm 4.1 ppm		
	2 k Ω to 20 k Ω 20 k Ω to 200 k Ω 200 k Ω to 2 M Ω	4.1 ppm 4.6 ppm 8.3 ppm		
	2 M Ω to 20 M Ω 20 M Ω to 200 M Ω 200 M Ω to 2 G Ω	40 ppm 400 ppm 0.36 %		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
DC CURRENT				
Specific values	100 μ A 1 mA 10 mA 100 mA 1 A	2.50 ppm 2.0 ppm 2.0 ppm 6.5 ppm 10 ppm	The stated CMCs are for values within $\pm 0.1\%$ of nominal	
Other values	0 μ A to 10 μ A 10 μ A to 20 μ A 20 μ A to 200 μ A 200 μ A to 20 mA 20 mA to 200 mA 200 mA to 1 A 1 A to 2 A 2 A to 10 A	15 nA 15 ppm 8.4 ppm 3.7 ppm 20 ppm 22 ppm 38 ppm 120 ppm		
	10 A to 20 A 20 A to 100 A	0.25 % 0.15 %	Generation capability only	
AC/DC TRANSFER				
VOLTAGE	100 mV to 220 mV 20 Hz to 20 kHz 20 kHz to 50 kHz	83 ppm 90 ppm		
	220 mV to 700 mV 20 Hz to 20 kHz 20 kHz to 50 kHz	71 ppm 64 ppm		
	700 mV to 2.2 V 20 Hz to 50 kHz	53 ppm		
	2.2 V to 7 V 20 Hz to 40 Hz 40 Hz to 50 kHz	46 ppm 40 ppm		
	7 V to 22 V 20 Hz to 20 kHz 20 kHz to 50 kHz	50 ppm 45 ppm		
	22 V to 70 V 20 Hz to 20 kHz 20 kHz to 50 kHz	58 ppm 51 ppm		
	70 V to 220 V 20 Hz to 50 kHz	69 ppm		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
AC/DC TRANSFER (cont'd)				
VOLTAGE (cont'd)	220 V to 700 V 45 Hz to 20 kHz	76 ppm		
	700 V to 1 kV 45 Hz to 20 kHz	74 ppm		
AC VOLTAGE	100 mV to 220 mV 20 Hz to 40 Hz 40 Hz to 50 kHz	86 ppm 74 ppm		
	220 mV to 700 mV 20 Hz to 40 Hz 40 Hz to 50 kHz	80 ppm 64 ppm		
	700 mV to 2.2 V 20 Hz to 50 kHz	60 ppm		
	2.2 V to 7 V 20 Hz to 40 Hz 40 Hz to 50 kHz	60 ppm 47 ppm		
	7 V to 22 V 20 Hz to 40 Hz 40 Hz to 50 kHz	62 ppm 50 ppm		
	22 V to 70 V 20 Hz to 20 kHz 20 kHz to 50 kHz	63 ppm 57 ppm		
	70 V to 200 V 20 Hz to 45 Hz	85 ppm		
	70 V to 220 V 45 Hz to 50 kHz	85 ppm		
	220 V to 700 V 45 Hz to 20 kHz 20 kHz to 50 kHz	90 ppm 310 ppm		
	700 V to 1 kV 45 Hz to 20 kHz 20 kHz to 33 kHz	89 ppm		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
AC CURRENT	40 Hz to 1 kHz 6 μ A to 22 μ A 22 μ A to 70 μ A 70 μ A to 100 μ A 100 μ A to 220 μ A 220 μ A to 700 μ A 700 μ A to 2.2 mA 2.2 mA to 7 mA 7 mA to 10 mA 10 mA to 22 mA 22 mA to 30 mA 30 mA to 70 mA 70 mA to 100 mA 100 mA to 220 mA 220 mA to 700 mA 700 mA to 1 A 1 A to 2.2 A 2.2 A to 7 A 7 A to 10 A	210 ppm 100 ppm 67 ppm 75 ppm 65 ppm 61 ppm 65 ppm 61 ppm 75 ppm 66 ppm 100 ppm 67 ppm 270 ppm 200 ppm 190 ppm 190 ppm 190 ppm 220 ppm		
	45 Hz to 1 kHz 10 A to 20 A 20 A to 100 A	1.3 % 0.75 %	Generation capability only	
FREQUENCY				
Specific Values	1 MHz & 10 MHz	1.0 parts in 10^9	For calibrating oscillators	
Other Values	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 100 kHz 100 kHz to 1 MHz 1 MHz to 500 MHz	1.5 parts in 10^3 1.6 parts in 10^4 1.6 parts in 10^5 1.6 parts in 10^6 1.6 parts in 10^7 1.8 parts in 10^8 2.4 parts in 10^9 1.2 parts in 10^9		
ELAPSED TIME				
Stop watches (mechanical and electronic)	0 s to 24 hours 10 s to 24 hours	0.060 s 0.41 s	Time reference measurement Real time measurement	



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED					
CAPACITANCE	At 1 kHz and 10 kHz 100 pF 1 nF	0.040 % 0.030 %			
	1 pF to 10 pF 10 pF to 100 pF 100 pF to 1 nF 1 nF to 1 μ F	1.5 % 0.18 % 0.13 % 0.063 %			
	At 100 Hz 1 μ F to 10 mF	1.5 %			
INDUCTANCE	At 1 kHz 10 μ H 100 μ H 3 mH 1 H	0.66 % 0.080 % 0.040 % 0.030 %			
	10 μ H to 100 μ H 100 μ H to 1 H 1 H to 10 H	0.61 % 0.13 % 0.24 %			
TEMPERATURE SIMULATION	Temperature indicators and simulators (t/c type), calibration by electrical simulation				
Base metal thermocouples	Type J, - 210 °C to 0 °C Type J, 0 °C to 1200 °C	0.091 °C 0.084 °C	excluding cold junction compensation		
	Type K, - 270 °C to - 200 °C Type K, - 200 °C to 0 °C Type K, 0 °C to 1370 °C	0.31 °C 0.099 °C 0.086 °C	excluding cold junction compensation		
	Type N, - 270 °C to - 200 °C Type N, - 200 °C to 0 °C Type N, 0 °C to 1300 °C	0.89 °C 0.12 °C 0.089 °C	excluding cold junction compensation		
	Type T, - 270 °C to - 200 °C Type T, - 200 °C to 0 °C Type T, 0 °C to 400 °C	0.24 °C 0.099 °C 0.085 °C	excluding cold junction compensation		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
TEMPERATURE SIMULATION (cont'd)				
Temperature indicators and simulators (t/c type), calibration by electrical simulation (cont'd)				
Cold junction compensation	At ambient temperature of 20 °C ± 2.0 °C	0.35 °C		
Base metal thermocouples	Type J, - 210 °C to 0 °C	0.15 °C	including cold junction compensation	
	Type J, 0 °C to 1200 °C	0.14 °C		
	Type K, - 270 °C to - 200 °C	0.33 °C	including cold junction compensation	
	Type K, - 200 °C to 0 °C	0.15 °C		
	Type K, 0 °C to 1370 °C	0.14 °C		
	Type N, - 270 °C to - 200 °C	0.90 °C	including cold junction compensation	
	Type N, - 200 °C to 0 °C	0.17 °C		
	Type N, 0 °C to 1300 °C	0.15 °C		
	Type T, - 270 °C to - 200 °C	0.26 °C	including cold junction compensation	
	Type T, - 200 °C to 0 °C	0.15 °C		
	Type T, 0 °C to 400 °C	0.14 °C		
Noble metal thermocouples	- 50 °C to 0 °C	0.24 °C	excluding cold junction compensation	
	0 °C to 250 °C	0.20 °C		
	250 °C to 1 760 °C	0.13 °C		
Cold junction compensation	At ambient temperature of 20 °C ± 2 °C	0.43 °C		
Noble metal thermocouples	- 50 °C to 0 °C	0.26 °C	including cold junction compensation	
	0 °C to 250 °C	0.23 °C		
	250 °C to 1 760 °C	0.17 °C		
PRT simulation (Pt 100)	- 200 °C to 0 °C	0.017 °C		
	0 °C to 100 °C	0.018 °C		
	100 °C to 400 °C	0.020 °C		
	400 °C to 630 °C	0.023 °C		
	630 °C to 850 °C	0.026 °C		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
TEMPERATURE				
Thermocouples				
Base metal	- 20 °C to 400 °C 200 °C to 420 °C 420 °C to 1200 °C	0.40 °C 0.80 °C 2.2 °C		
Noble metal	0 °C to 420 °C 420 °C to 1200 °C	0.80 °C 2.3 °C		
Resistance thermometers	- 20 °C to 200 °C 200 °C to 420 °C	0.070 °C 0.60 °C		
Electronic thermometers with sensors. Analogue or digital	Ranges as per sensor			
PRESSURE				
Hydraulic pressure (Gauge)				
Calibration of pressure indicating instruments and gauges	600 kPa to 120 MPa	0.010 %	Calibration of pressure measuring devices with an electrical output may be undertaken.	
Pneumatic pressure (Gauge)				
Calibration of pressure indicating instruments and gauges	3.70 kPa to 3.5 MPa	0.010 %		
Pneumatic pressure (Absolute)				
Calibration of pressure indicating instruments and gauges	3.70 kPa to 3.5 MPa 75 kPa to 120 kPa	0.010 % + 5.0 Pa 15 Pa		



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DIMENSIONAL				
MEASURING INSTRUMENTS AND MACHINES				
Vernier gauges	BS 887:2008	Overall performance: 10 + (30 x length in m)		Derby Rotatives
Caliper	0 to 150			
Height	BS 1643:2008 0 to 150			
Depth	BS 6365:2008 0 to 150			
Micrometers		Heads: 2.0 between any two points Extension rods: 1.0 + (10 x length in m)		
External	BS 870:2008 0 to 150			
Internal	BS 959:2008 0 to 150			
Depth	BS 6468:2008 0 to 150			
Dial gauges and dial test indicators	BS 907:2008 and BS 2795:1981 0 to 50	1.0		
ELECTRICAL				
DC VOLTAGE	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	5.0 μ V 10 ppm 10 ppm 15 ppm 15 ppm		Sirfin
DC RESISTANCE	0 Ω to 1 Ω 1 Ω to 20 Ω 20 Ω to 200 Ω 200 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	35 μ Ω 35 ppm 17 ppm 17 ppm 30 ppm 80 ppm 0.080 % 1.5 %		
DC CURRENT	0 μ A to 10 μ A 10 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	1.5 nA 150 ppm 130 ppm 130 ppm 150 ppm 280 ppm		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
ELECTRICAL (cont'd)				
AC VOLTAGE	40 Hz to 10 kHz: 10 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1 kV	600 ppm 250 ppm 250 ppm 250 ppm 450 ppm		
AC CURRENT	60 Hz to 1 kHz: 10 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 1 A	0.18 % 0.13 % 0.13 % 0.13 % 0.25 %		
Frequency	10 Hz to 10 MHz	0.23 ppm		
TEMPERATURE SIMULATION Temperature indicators and simulators calibration by electrical simulation				
PRT simulation (Pt 100)	- 50 °C to 100 °C	0.050 °C		
HUMIDITY				
Dew point	- 10 °C to 0 °C 0 °C to 20 °C	0.10 °C dp 0.10 °C dp		
LENGTH				East Kilbride
Thread measuring cylinders	BS3777:1964 and BS 5590:1978 and specials 0.1 to 5.0 diameter	0.50 on diameter		
Plain plug gauges (parallel), cylindrical setting standards, gear measuring cylinders and rollers	1 to 50 diameter 50 to 100 diameter 100 to 150 diameter	0.50 0.80 1.0 on diameter		
Plain ring gauges (parallel) and setting standards	1 to 50 diameter 50 to 100 diameter 100 to 150 diameter	0.80 1.2 1.8 on diameter		



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Trescal EMS - Rolls Royce
Issue No: 033 Issue date: 13 March 2012

Calibration performed by the Organisation at the locations specified

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				
LENGTH (cont'd)				
Length gauges, flat and spherical ended	0 m to 1 m	1.0 + (5.0 x length in m)		
Plain gap gauges (parallel)	BS 969:2008 0.5 up to 100 100 up to 200	3.0 5.0		
Screw plug gauges (parallel) including check and setting plugs See Note 5	1 to 100 diameter	2.5 on pitch diameter		
Screw pitch	0.2 to 8	1.5		
Screw flank angle	0 ° to 50 °	5.0		
Parallels	BS 906:Parts 1 & 2:1992 5 to 50 x 100 x 400	1.5 to 5.0, dependant on size and grade		
Vee blocks	BS 3731:1987 to 150	2.5 to 5.0, dependent on size and grade		
FORM				
Surface plates Granite Cast iron	BS 817:2008 160 x 100 to 4 m x 4 m	1.5 + (0.80 x diagonal in m) See Note 3		
Straightedges Cast iron Steel Granite	BS 5204:Part 1:1975 0 to 2m	1 .0 + (2.0 x length in m) See Note 3		
MEASURING INSTRUMENTS AND MACHINES				
LENGTH				
Micrometers External	BS 870:2008 0 to 300	Heads: 2.0 Setting and		
Internal	BS 959:2008 0 to 300	Extension rods: 1.0		
Depth	BS 6468:2008 0 to 300	+ (5.0 x length in m)		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
MEASURING INSTRUMENTS AND MACHINES (cont'd)				
LENGTH				
Micrometer heads	BS 1734:1951 0 to 100	1.0		
Bench micrometer	0 to 100	Overall performance 1.0		
Height setting micrometer	0 to 300	Heads 1.0 Stepped column 1.6 Overall performance 2.0		
Riser Blocks for above	150 300	1.0 2.0		
Vernier gauges				
Caliper	BS 887:2008 0 to 300	Overall performance: 10 + (30 x length in m)		
Height	BS 1643:2008 0 to 300			
Depth	BS 6365:2008 0 to 300			
Dial gauges and dial test indicators	BS 907:2008 and BS 2795:1981 0 to 50	1.0		
Dividing heads / Rotary tables	0 to 750 capacity	Linear dimensions 1.0 + (10 x length in m) Overall angular performance 3 seconds of arc		
Spirit levels	BS 958:1968 and BS 3509:1962 Nominal sensitivity 5 seconds of arc to 60 minutes of arc	Mean sensitivity: 10 % of nominal Minimum 0.50 seconds of arc		
Levels, electronic	2 seconds of arc to 20 minutes of arc	2.0 seconds of arc		



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RANGE IN MILLIMETRES AND UNCERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED				
Micrometers External Internal Depth Vernier gauges Caliper Depth Dial gauges and dial test indicators	BS 870:2008 0 to 150 BS 959:2008 0 to 150 BS 6468:2008 0 to 150 BS 887:2008 0 to 150 BS 6365:2008 0 to 150 BS 907:2008 and BS 2795:1981 0 to 50	Heads: 2.0 Extension rods: 1.0 + (8.0 x length in m) Overall performance: 10 + (30 x length in m) 1.5		Sunderland
FUEL FLOW Flow rate - volume Flow rate - mass)	5 l/hr to 27000 l/hr 4 kg/hr to 21330 kg/hr	0.10 % 0.20 %	Calibration fluid AVTUR (Aviation fuel)	Bristol
FORM Surface plates Granite Cast iron ELECTRICAL Temperature indicators and simulators (t/c type), calibration by electrical simulation: Base metal thermocouples types	As BS 817:2008 160 x 100 to 4 m x 4 m 0 °C to 1370 °C -200 °C to 0 °C -270 °C to -200 °C	1.5 + (0.80 x diagonal in m) See Note 3 ± 0.45 °C ± 0.60 °C ± 1.80 °C	Internal Reference junction enabled. Ambient temperature of site 0°C to 45°C	



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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							
Nobel metal thermocouple types	250 °C to 1760 °C -50°C to 250°C	± 0.70 °C ± 0.80 °C	0 °C to 45 °C				
RTD Pt100	- 200 °C to 850 °C	0.030 % + 0.10 °C 0.050 % + 0.10 °C	17 °C to 28 °C 0 °C to 45 °C				
DC Voltage	-20 mV to 200 mV	0.030 % + 5.0 µV 0.050 % + 8.5 µV	17 °C to 28 °C 0 °C to 45 °C				
	-0.2 V to 2 V	0.030 % + 20 µV 0.050 % + 22 µV	17 °C to 28 °C 0 °C to 45 °C				
	-2 V to 20 V	0.030 % + 200 µV 0.050 % + 200 µV	17 °C to 28 °C 0 °C to 45 °C				
DC Current	Measure -5 mA to 50 mA	0.030 % + 0.60 µA 0.050 % + 0.60 µA	17 °C to 28 °C 0 °C to 45 °C				
					Generate 0 mA to 50 mA	0.030 % + 0.60 µA 0.050 % + 0.60 µA	17 °C to 28 °C 0 °C to 45 °C
DC Resistance	Measure 0 Ω to 500 Ω	0.030 % + 20 mΩ 0.050 % + 20 mΩ	17 °C to 28 °C 0 °C to 45 °C				
					Generate 0 Ω to 500 Ω	0.030 % + 30 mΩ 0.050 % + 30 mΩ	17 °C to 28 °C 0 °C to 45 °C
					Measure 0 Ω to 5 kΩ	0.030 % + 200 mΩ 0.050 % + 200 mΩ	17 °C to 28 °C 0 °C to 45 °C
Measure 0 Ω to 5 kΩ	0.030 % + 300 mΩ 0.050 % + 300 mΩ	17 °C to 28 °C 0 °C to 45 °C					
Frequency Measure	1 Hz to 200 Hz 200 Hz to 2 kHz 2 kHz to 20 kHz	0.010 % + 0.005 Hz 0.010 % + 0.05 Hz 0.010 % + 0.5 Hz	17 °C to 28 °C				
	1 Hz to 200 Hz 200 Hz to 2 kHz 2 kHz to 20 kHz	0.030 % + 0.005 Hz 0.030 % + 0.05 Hz 0.030 % + 0.5 Hz	0 °C to 45 °C				
END							