

# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

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

 <b>UKAS CALIBRATION 4332</b>  <b>Accredited to ISO/IEC 17025:2017</b>	<b>Poole Instrument Calibration Limited</b>  <b>Issue No: 010    Issue date: 19 August 2020</b>	
	<b>Unit 1 Cabot Business Village Holyrood Close Poole Dorset BH17 7BA</b>	<b>Contact: Mr Matthew Suter Tel: +44 (0)1202 658333 Fax: +44 (0)1202 659966 E-Mail: m.suter@pooleinstruments.com Website: www.pooleinstruments.co.uk</b>

**Calibration performed by the Organisations at the locations specified below**

### Locations covered by the organisation and their relevant activities

#### Laboratory locations:

Location details	Activity	Location code
<b>Address</b> Unit 1 Cabot Business Village Holyrood Close Poole Dorset BH17 7BA  <b>Local contact</b> Mr Matthew Suter  Tel: +44 (0)1202 658333 Fax: +44 (0)1202 659966 Email: m.suter@pooleinstruments.com	Electrical and Temperature.	P

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

Location details	Activity	Location code
The customers' 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.	Electrical and Temperature.	S



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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
<b>ELECTRICAL</b>			Electrical calibrations are performed as a comparison against a reference standard	
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	5.0 $\mu$ V 20 $\mu$ V 0.11 mV 1.0 mV 20 mV	Outputs of instruments can be measured to the stated uncertainties	P
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 1000 V	7.0 $\mu$ V 15 $\mu$ V 0.40 mV 5.0 mV 10 mV	Values can be generated for the calibration of measuring instruments	P
DC Current Measurement	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	0.020 $\mu$ A 0.10 $\mu$ A 1.0 $\mu$ A 10 $\mu$ A 0.25 mA	Outputs of instruments can be measured to the stated uncertainties	P
DC Current Generation	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 30 A	0.040 $\mu$ A 0.20 $\mu$ A 1.0 $\mu$ A 15 $\mu$ A 0.25 mA 7 mA	Values can be generated for the calibration of measuring instruments	P
DC Current Measurement	0 A to 60 A 60 A to 300 A 300 A to 1500 A	100 mA 160 mA 650 mA	Simulated current using multi turn coil, for the calibration of clamp-on ammeters.	P
DC Resistance Measurement	0 $\Omega$ to 20 $\Omega$ 20 $\Omega$ to 200 $\Omega$ 200 $\Omega$ to 2 k $\Omega$ 2 k $\Omega$ to 20 k $\Omega$ 20 k $\Omega$ to 200 k $\Omega$ 200 k $\Omega$ to 2 M $\Omega$ 2 M $\Omega$ to 20 M $\Omega$ 20 M $\Omega$ to 200 M $\Omega$ 200 M $\Omega$ to 1 G $\Omega$	0.50 m $\Omega$ 2.0 m $\Omega$ 20 m $\Omega$ 0.20 $\Omega$ 2.0 $\Omega$ 20 $\Omega$ 1.0 k $\Omega$ 120 k $\Omega$ 2.5 M $\Omega$	Outputs of instruments can be measured to the stated uncertainties	P



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<b>ELECTRICAL</b> (cont'd)			Electrical calibrations are performed as a comparison against a reference standard	
DC Resistance (cont'd)				
Generation (2 wire)	0.2 $\Omega$ 0.3 $\Omega$ 1 $\Omega$ 10 $\Omega$ 100 $\Omega$ 1 k $\Omega$ 10 k $\Omega$ 100 k $\Omega$ 1 M $\Omega$ 10 M $\Omega$ 100 M $\Omega$ 1 G $\Omega$	0.010 $\Omega$ 0.02 $\Omega$ 0.015 $\Omega$ 0.020 $\Omega$ 0.015 $\Omega$ 0.020 $\Omega$ 0.06 $\Omega$ 4.0 $\Omega$ 0.02 k $\Omega$ 2.1 k $\Omega$ 0.03 M $\Omega$ 5.5 M $\Omega$	Nominal values can be generated for the calibration of measuring instruments 2 Wire	P
Generation (4 wire)	100 m $\Omega$ 1 $\Omega$ 10 $\Omega$ 100 $\Omega$ 1 k $\Omega$ 10 k $\Omega$ 100 k $\Omega$	2.0 m $\Omega$ 2.0 m $\Omega$ 2.0 m $\Omega$ 4.5 m $\Omega$ 0.015 $\Omega$ 0.03 $\Omega$ 1.0 $\Omega$		P
AC Voltage				
Measurement	40 Hz to 1 kHz 2 mV to 200 mV 200 mV to 2V 2 V to 20 V 20 V to 200 V  1 kHz to 60 kHz 2 mV to 200 mV 200 mV to 2V 2 V to 20 V 20 V to 200 V  45 Hz to 30 kHz 200 V to 1 kV	15 $\mu$ V 150 $\mu$ V 1.0 mV 10 mV  50 $\mu$ V 0.50 mV 4.0 mV 0.040 V  1.4 V	Outputs of instruments can be measured to the stated uncertainties	P



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<b>ELECTRICAL</b> (cont'd)			Electrical calibrations are performed as a comparison against a reference standard	
AC Voltage (cont'd)				
Generation	0 mV to 20 mV 40 Hz to 206 Hz	0.070 mV	Values can be generated for the calibration of measuring instruments	P
	20 mV to 200 mV 10 Hz to 100 kHz	0.30 mV		
	200 mV to 2 V 10 Hz to 100 kHz	2.0 mV		
	2 V to 20 V 40 Hz to 20 kHz	0.050 V		
	20 V to 200 V 40 Hz to 20 kHz	0.35 V		
	200 V to 700 V 40 Hz to 10 kHz	0.8 V		
	700 V to 1000 V 56 Hz	0.70 V		
AC Current				
Measurement	40 Hz to 3 kHz 0 $\mu$ A to 200 $\mu$ A 200 $\mu$ A to 2 mA	0.10 $\mu$ A 0.50 $\mu$ A	Outputs of instruments can be measured to the stated uncertainties	P
	40 Hz to 5 kHz 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	5.0 $\mu$ A 0.050 mA 2.0 mA		



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<b>ELECTRICAL</b> (cont'd)			Electrical calibrations are performed as a comparison against a reference standard	
AC Current (cont'd)				
Generation	40 Hz to 206 Hz 0 $\mu$ A to 25 $\mu$ A	0.35 $\mu$ A	Values can be generated for the calibration of measuring instruments	P
	40 Hz to 1 kHz 25 $\mu$ 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	0.50 $\mu$ A 3.5 $\mu$ A 0.030 mA 0.30 mA 3.5 mA		
	40 Hz to 100 Hz 2 A to 20 A	0.012 A		
	56 Hz 2 A to 30 A	0.018 A		
	50 Hz 0 A to 60 A 60 A to 300 A 300 A to 1500 A	100 mA 270 mA 1.2 A	Simulated current using multi turn coil, for the calibration of clamp-on ammeters.	
Capacitance				
Generation	1 nF 10 nF 20 nF 50 nF 100 nF 1 $\mu$ F 10 $\mu$ F	3.0 pF 20 pF 35.0 pF 0.010 nF 0.015 nF 5.0 nF 0.25 nF	Nominal values can be generated for the calibration of measuring instruments	P
Frequency				
Generation	10 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 1 MHz 1 MHz to 10 MHz	0.0010 Hz 0.005 Hz 0.05 Hz 0.10 Hz 0.25 Hz 0.50 Hz 0.005 kHz 0.05 kHz	Values can be generated for the calibration of measuring instruments	P



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<b>TEMPERATURE SIMULATION</b>			Temperature simulation calibrations are performed as a comparison against a reference standard	
Temperature indicators, calibration by electrical simulation, for the following sensor types:				
Noble metal thermocouples			with cold junction Compensation	P
Type R	0 °C to 1700 °C	0.50 °C		
Type S	-50 °C to +1700 °C	0.50 °C		
Base metal thermocouples			with cold junction Compensation	P
Type K	-140 °C to +1340 °C	0.30 °C		
Type J	-150 °C to +750 °C	0.30 °C		
Type T	-250 °C to +400 °C	0.40 °C		
Type N	-150 °C to +1300 °C	0.30 °C		
Type E	0 °C to 800 °C	0.32 °C		
Resistance thermometer (Pt100)	-100 °C 0 °C 30 °C 60 °C 100 °C 200 °C 400 °C 800 °C	0.050 °C 0.030 °C 0.040 °C 0.050 °C 0.050 °C 0.060 °C 0.070 °C 0.080 °C	Nominal values	P
Base metal thermocouples			with cold junction Compensation	S
Type K	-50 °C to +1300 °C	0.71 °C		
Type J	-50 °C to +1100 °C	0.60 °C		
Type T	-50 °C to +390 °C	0.76 °C		
Type N	-50 °C to +1300 °C	0.93 °C		
Resistance thermometer (Pt100)	-50 °C to +600 °C	0.28 °C		S
Temperature simulators, calibration by electrical simulation, for the following sensor types:				
Noble metal thermocouples			with cold junction Compensation	P
Type R	0 °C to 1600 °C	0.70 °C		
Type S	0 °C to 1600 °C	0.70 °C		



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<b>TEMPERATURE SIMULATION (cont'd)</b>			Temperature simulation calibrations are performed as a comparison against a reference standard	
Temperature indicators, calibration by electrical simulation, for the following sensor types: (cont'd)				
Base metal thermocouples			with cold junction Compensation	P
Type K	-150 °C to +555 °C 555 °C to 1300 °C	0.50 °C 0.50 °C		
Type J	-150 °C to +1100 °C	0.50 °C		
Type T	-150 °C to +100 °C 100 °C to 390 °C	0.50 °C 0.50 °C		
Type N	-150 °C to +1250 °C	0.50 °C		
Type E	-150 °C to +355 °C 355 °C to 900 °C	0.60 °C 0.40 °C		
Resistance thermometer	-200 °C to 0 °C 0 °C to 800 °C	0.010 °C 0.020 °C		P
Base metal thermocouples			with cold junction Compensation	S
Type K	-50 °C to 0 °C 0 °C to 1300 °C	1.0 °C 1.0 °C		
Type J	-50 °C to +750 °C	1.0 °C		
Type T	-50 °C to 0 °C 0 °C to 390 °C	1.1 °C 1.0 °C		
Type N	-50 °C to +1300 °C	1.0 °C		
Resistance thermometer (Pt100)	-50 °C to +600 °C	0.24 °C		S



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<b>TEMPERATURE</b>			Temperature calibrations are performed as a comparison against a reference standard	
Resistance thermometers and Electronic thermometers with sensors	-30 °C to +140 °C	0.10 °C	In Triple point of water cell	P
	0.01 °C	0.035 °C		
	140 °C to 400 °C 400 °C to 600 °C	0.15 °C 0.18 °C		
Base metal thermocouples	-30 °C to 200 °C	0.40 °C		P
	200 °C to 600 °C	0.6 °C		
Noble metal thermocouples  Type R & Type S	0 °C to 200 °C	0.60 °C		
	200 °C to 400 °C	0.75 °C		
	400 °C to 600 °C	1.0 °C		
Metal block calibrators	-40 °C to +30 °C	0.045 °C		P
	30 °C to 230 °C	0.05 °C		
	230 °C to 420 °C 420 °C to 660 °C	0.06 °C 0.085 °C		
Temperature surveys				
Temperature controlled, incubators, ovens, environmental chambers, fridges/refrigerators and freezers	-75 °C to +200 °C	0.75 °C	Single and multipoint time dependent temperature profiling, also referred to as spatial temperature surveying or mapping	S
	200 °C to 600 °C	1.0 °C		
Temperature indicators and recorders, with temperature sensor(s)	-30 °C to +140 °C	0.16 °C		S
	140 °C to 400 °C	0.20 °C		
	200 °C to 400 °C	0.25 °C		
	400 °C to 600 °C	0.30 °C		





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EQUIPMENT FOR IEE 16 <sup>TH</sup> /17 <sup>TH</sup> /18 <sup>TH</sup> EDITION WIRING TESTING				
<u>LOOP TESTERS</u>				
AC Resistance at 50 Hz	Nominal applied resistances		Electrical calibrations are performed as a comparison against a reference standard	P
	0.05 Ω	3.6 mΩ		
	0.10 Ω	3.9 mΩ		
	0.22 Ω	3.6 mΩ		
	0.33 Ω	4.1 mΩ		
	0.5 Ω	4.9 mΩ		
	1 Ω	6.6 mΩ		
	5 Ω	20 mΩ		
	10 Ω	37 mΩ		
	100 Ω	370 mΩ		
	1 kΩ	3.0 Ω		
<u>CONTINUITY TESTERS</u>				
DC Resistance	1 mΩ to 100 mΩ	1.0 mΩ	P	
	100 mΩ to 2 Ω	2.0 mΩ		
	2 Ω to 100 Ω	3.8 mΩ		
	100 Ω to 1 kΩ	14 mΩ		
	1 kΩ to 10 kΩ	32 mΩ		
	10 kΩ to 50 kΩ	2.0 Ω		
Continuity Current	0 mA to 400 mA	70 uA	P	
<u>INSULATION TESTERS</u>				
DC Resistance	10 kΩ to 20 kΩ	0.12 %	P	
	20 kΩ to 2 MΩ	0.12%		
	2 MΩ to 4 MΩ	0.12 %		
	4 MΩ to 6 MΩ	0.12 %		
	6 MΩ to 9 MΩ	0.60 %		
	9 MΩ to 20 MΩ	0.85 %		
	20 MΩ to 90 MΩ	0.65 %		
	90 MΩ to 400 MΩ	1.3 %		
	400 MΩ to 800 MΩ	1.2 %		
	800 MΩ to 2 GΩ	1.30 %		
	2 GΩ to 10 GΩ	3.0 %		
DC Voltage	50 V	0.80 V	P	
	100 V	1.1 V		
	150 V	1.4 V		
	200 V	1.7 V		
	250 V	2.0 V		
	500 V	3.5 V		
	1000 V	6.5 V		
Earth Resistance	100 mΩ to 2 Ω	2.0 mΩ	P	
	2 Ω to 100 Ω	3.8 mΩ		
	100 Ω to 1 kΩ	14 mΩ		



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EQUIPMENT FOR IEE 16TH/17TH/18TH EDITION WIRING TESTING (cont'd)					
<u>RCD TESTERS</u>					
Trip time	20 ms to 390 ms 390 ms to 1 s	0.75 ms 9.3 ms	Electrical calibrations are performed as a comparison against a reference standard	P	
Trip Current at 50 Hz	10 mA 15 mA 30 mA 60 mA 100 mA 150 mA 300 mA 500 mA 1 A	110 µA 170 µA 280 µA 520 µA 770 µA 1.2 mA 2.4 mA 4.0 mA 8.0 mA		P	
AC Voltage Source at 50 Hz	100 V 200 V 230 V 300 V 400 V	0.27 V 0.36 V 0.48 V 0.48 V 0.66 V		P	
<u>PORTABLE APPLIANCE TESTERS</u>					
Earth Bond Resistance at 50Hz	0.05 Ω 0.1 Ω 0.17 Ω 0.28 Ω 0.38 Ω 0.54 Ω 1 Ω 5 Ω 10 Ω 100 Ω 1 kΩ	3.5 mΩ 5.0 mΩ 5.5 mΩ 5.5 mΩ 6.0 mΩ 6.5 mΩ 9.0 mΩ 25 mΩ 40 mΩ 375 mΩ 4.0 Ω		P	
Earth Continuity and Bond Current at 50Hz	100 mA 200 mA 200 mA to 500 mA 500 mA to 4 A 4 A to 8 A 8 A to 12 A 12 A to 25 A	4.9 mA 5.7 mA 8.5 mA 80 mA 115 mA 150 mA 270 mA		P	
Earth Continuity Current DC	10 mA to 100 mA 100 mA to 300 mA	1.3 mA 3.0 mA			
Leakage Current at 50Hz	0 mA to 1 mA 1 mA to 10 mA 10 mA to 20 mA	3.0 µA 8.0 µA 50 µA		P	



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EQUIPMENT FOR IEE 16TH/17TH/18TH EDITION WIRING TESTING (cont'd)				
Insulation Resistance DC <i>See DC Resistance Insulation Testers</i>			Electrical calibrations are performed as a comparison against a reference standard	P
Insulation Resistance Test Voltage	50 V 100 V 150 V 200 V 250 V 500 V 1000 V	0.8 V 1.1 V 1.4 V 1.7 V 2.0 V 3.5 V 6.5 V		P
Earth Continuity Resistance <i>See DC Resistance Contunity Testers</i>				
Flash Test Voltage at 50 Hz	1 kV to 1.5 kV (Class 1) 1.5 kV to 3 kV (Class 2)	45 V 80 V		P
Flash Test Current	0.67 mA to 1 mA (Class 1) 0.34 mA to 1 mA (Class 2)	40 µA 40 µA		P
Load at 50Hz	49 VA to 7.5 kVA	0.20 VA		P
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 uncertainty of measurement 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 CIPM-ILAC definition of the CMC is as follows:

A CMC is a calibration and measurement capability available to customers under normal conditions:

- (a) as published in the BIPM key comparison database (KCDB) of the CIPM MRA; or
- (b) as described in the laboratory's scope of accreditation granted by a signatory to the ILAC Arrangement.

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 CMC is calculated according to the procedures given in M3003 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 CMC in certificates issued under its accreditation.

The CMC may be described using various methods in the Schedule of Accreditation:

As a single value that is valid throughout the range.

As an explicit function of the measurand or of a parameter (see below).

As a range of values. The range is stated such that the customer can make a reasonable estimate of the likely uncertainty at any point within the range.

As a matrix or table where the CMCs depend on the values of the measurand and a further quantity.

In graphical form, providing there is sufficient resolution on each axis to obtain at least two significant figures for the CMC.

### Expression of CMCs - symbols and units

In general, only units of the SI and those units recognised for use with the SI are used to express the values of quantities and of the associated CMCs. Nevertheless, other commonly used units may be used where considered appropriate for the intended audience. For example, the term "ppm" (part per million) is frequently used by manufacturers of test and measurement equipment to specify the performance of their products. Terms like this may be used in Schedules of Accreditation where they are in common use and understood by the users of such equipment, providing their use does not introduce any ambiguity in the capability that is being described.

When the CMC is expressed as an explicit function of the measurand or of a parameter, this often comprises a relative term (e.g., percentage) and an absolute term, i.e. one expressed in the same units as those of the measurand. This form of expression is used to describe the capability that can be achieved over a range of values. Some examples are shown below. It should be noted that these expressions are *not* mathematical formulae but are instead written in a commonly used shorthand for expressing uncertainties - therefore, for purposes of clarity, an indication of how they are to be interpreted is also provided below.

DC voltage, 100 mV to 1 V: 0.0025 % + 5.0  $\mu$ V

Over the range 100 mV to 1 V, the CMC is 0.0025 %·V + 5.0  $\mu$ V, where V is the measured voltage.

Hydraulic pressure, 0.5 MPa to 140 MPa: 0.0036 % + 0.12 ppm/MPa + 4.0 Pa

Over the range 0.5 MPa to 140 MPa, the CMC is 0.0036 %·p + (0.12·10<sup>-6</sup>·p·10<sup>-6</sup>) + 4.0 Pa, where p is the measured pressure in Pa.

It should be noted that the percentage symbol (%) simply represents the number 0.01. In cases where the CMC is stated only as a percentage, this is to be interpreted as meaning percentage of the measured value or indication.

Thus, for example, a CMC of 1.5 % means 1.5 · 0.01 · i, where i is the instrument indication.