Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

0318

Accredited to ISO/IEC 17025:2017

CoMech Metrology Limited

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Calibration performed at the above address only

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k=2)	Remarks
RANGE IN MILLIMETRES AND UNDERTAINTY IN MICROMETRES UNLESS OTHERWISE STATED			
MEASURING INSTRUMENTS AND MACHINES			NOTES
Micrometers			Calibrations may be made in metric or imperial units.
External	BS 870:2008, 0 to 600	Heads 2.0	
Internal	BS 959:2008, 0 to 600	Setting and extension rods	
Depth	BS 6468:2008, 0 to 300	1.0 + (5.0 x length in m)	
Vernier gauges			
Caliper	BS 887:2008 0 to 600		
Height	BS 1643:2008, 0 600	Overall performance:	
Depth	BS 6365:2008, 0 to 300	10 + (30 x length in m)	
Dial gauge type	0 to 300		
Digital type	0 to 300		
Dial gauges and dial test indicators	0 to 50 BS 907:2008 and BS 2795:1981	3.6	
Surface texture of Gauges (excluding surface texture standards)	As BS 1134:Part 1:1988	7.0 % (minimum 1.0 μm Ra)	
Length gauges, flat and spherical ended (excluding length bars	25 to 1200	1.0 + (5.0 x length in m)	Using a length measuring Machine or by comparison with End standards
Plain plug gauges parallel	0 to 100	2.1	Using a length measuring machine
Receiver and position gauges, jigs, fixtures	Track Grinding Gauges (HB221) 0 to 1440	29	Procedure CM-C-686
	Autocoupler Pin Checking Gauges (HB035) 0 to 1.0	3.0	Procedure CM-C-706
	Brake Pad Wear Gauge (HB100) 0 to 10.0	2.7	Procedure CM-C-705
	Back to Back Gauges (HB018) 0 to 1360	8.1	Procedure CM-C-704

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k=2)	Remarks
PRESSURE			
Gas pressure (gauge)			Methods consistent with EURAMET CG3
Calibration of pressure measuring instruments and gauges.	- 80 kPa to 2 MPa	0.48 kPa	
Gas pressure (absolute)			
Calibration of pressure measuring instruments and gauges.	70 kPa to 2 MPa	0.48 kPa	
Hydraulic pressure (gauge)			
Calibration of pressure measuring instruments and gauges.	300 kPa to 5.5 MPa 5 MPa to 110 MPa	0.044 % 0.030 %	
TORQUE			
Hand torque tools (excluding torque screwdrivers)	As BS EN ISO 6789 :2017 5 N·m to 1356 N·m	1.0 %	Calibrations may also be given in lbf.in and lbf.ft.
ELECTRICAL MEASUREMENTS			
Electrical values and uncertainties listed below are applicable for the calibration of both measurement instruments and for instruments with an output. The method used is by direct comparison against laboratory standards unless otherwise stated in the remarks column			
DC Voltage	0 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1.1 kV	10 ppm + 860 nV 9.2 ppm + 3.5 µV 9.2 ppm + 25 µV 12 ppm + 340 µV 18 ppm + 3.4 mV	
High Voltage	1 kV to 40 kV	0.70 % + 15 V	
DC Current			
	0 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 10.5 A 10.5 A to 20 A 20 A to 105 A 105 A to 525 A 525 A to 1000 A	23 ppm + 3.3 nA 23 ppm + 21 nA 23 ppm + 200 nA 40 ppm + 2.3 µA 130 ppm + 43 µA 740 ppm + 1.2 mA 0.45 % + 26 mA 750 ppm + 12 mA 750 ppm + 60 mA 0.50 % + 1.3 A	Output values above 10 A -Simulation using a multi - turn Coil

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k=2)	Remarks
ELECTRICAL MEASUREMENTS (cont'd)			
Resistance			
	0 Ω to 10 Ω	17 ppm + 180 µΩ	
	10 Ω to 100 Ω	14 ppm + 1.0 mΩ	
	100 Ω to 1 kΩ	12 ppm + 58 mΩ	
	1 kΩ to 10 kΩ	12 ppm + 84 mΩ	
	10 kΩ to 100 kΩ	12 ppm + 1.0 Ω	
	100 kΩ to 1 MΩ	17 ppm + 61 Ω	
	1 MΩ to 100 MΩ	58 ppm + 320 Ω	
	10 MΩ to 100 MΩ	580 ppm + 32 kΩ	
	100 MΩ to 1.1 GΩ	0.58 % + 720 kΩ	
	1 GΩ to 2 GΩ	21 MΩ	
AC Voltage			
	1 mV to 100 mV		
	50 Hz to 1 kHz	700 ppm + 17 µV	
	1 kHz to 10 kHz	240 ppm + 16 µV	
	10 kHz to 50 kHz	0.16 % + 67 µV	
	100 mV to 1 V		
	40 Hz to 1 kHz	710 ppm + 130 µV	
	1 kHz to 10 kHz	250 ppm + 130 µV	
	10 kHz to 50 kHz	0.18 % + 1.5 mV	
	1 V to 10 V		
	40 Hz to 1 kHz	700 ppm + 1.3 mV	
	1 kHz to 10 kHz	250 ppm + 1.3 mV	
	10 kHz to 50 kHz	0.18 % + 4.9 mV	
	10 V to 100 V		
	40 Hz to 1 kHz	700 ppm + 13 mV	
	1 kHz to 10 kHz	360 ppm + 12 mV	
	10 kHz to 50 kHz	0.18 % + 50 mV	
	100 V to 750 V		
	40 Hz to 1 kHz	940 ppm + 240 mV	
	1 kHz to 10 kHz	0.18 % + 460 mV	
	750 V to 1050 V		
	10 Hz to 3 kHz	940 ppm + 160 mV	
	3 kHz to 10 kHz	9304ppm + 250 mV	
	10 kHz to 20 kHz	0.14 % + 370 mV	
High Voltage	1 kV to 40 kV 50 Hz to 60 Hz	1.5 % + 45 V	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks
ELECTRICAL MEASUREMENTS (cont'd)			
AC Current			
	1 µA to 100 µA *40 Hz to 1 kHz*	 0.18 % + 38 nA	
	100 µA to 1 mA *40 Hz to 1 kHz*	 0.46 % + 270 nA	
	1 mA to 10 mA *40 Hz to 1 kHz* *1 kHz to 5 kHz*	 0.47 % + 2.8 µA 0.035 % + 5.3 µA	
	10 mA to 100 mA *40 Hz to 1 kHz*	 0.46 % + 15 µA	
	100 mA to 1 A *40 Hz to 1 kHz*	 0.46 % + 340 µA	
	1 A to 3.2 A *10 Hz to 3 kHz* *3 kHz to 10 kHz*	 0.12 % + 560 µA 0.13 % + 3.0 mA	
AC Current	3.2 A to 10.5 A *10 Hz to 3 kHz* *3 kHz to 10 kHz*	 0.23 % + 4.4 mA 0.58 % + 12 mA	
	10.5 A to 105 A *10 Hz to 400 Hz*	 0.28 % + 44 mA	Output values above 10 A -Simulation using a multi -turn coil
	105 A to 525 A *10 Hz to 400 Hz*	 0.28 % + 220 mA	
Capacitance 1 kHz	0.5 nF to 4 nF 4 nF to 40 nF 40 nF to 400 nF 400 nF to 4 µF 4 µF to 40 µF 40 µF to 400 µF 400 µF to 4 mF 4 mF to 40 mF	0.50 % + 18 pF 0.40 % + 36 pF 0.40 % + 190 pF 0.50 % + 580 pF 0.60 % + 20 nF 0.60 % + 190 nF 0.60 % + 59 µF 0.20 % + 70 µF	Simulated values for the Calibration of capacitance Meters.
17th Edition capability			
Insulation Resistance	10 kΩ to 40 kΩ 40 kΩ to 200 kΩ 200 kΩ to 10 MΩ 10 MΩ to 1 GΩ 1 GΩ to 2 GΩ	200 ppm + 15 Ω 250 ppm + 15 Ω 500 ppm + 590 Ω 0.22 % + 120 kΩ 0.52 % + 120 kΩ	
Insulation Resistance: test current	0 mA to 9.9 mA	76 µA	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks
ELECTRICAL MEASUREMENTS (cont'd)			
Continuity resistance	100 mΩ to 400 mΩ 400 mΩ to 5 Ω 5 Ω to 30 Ω 30 Ω to 200 Ω 200 Ω to 2 kΩ 2 kΩ to 10 kΩ	1.0 % + 1.5 mΩ 0.80 % + 8.3 mΩ 0.12 % 0.11 % 0.11 % 0.17 %	
Continuity resistance current	50 mA to 400 mA	21 %	
Voltage Output	3 V to 600 V 3 V *50 Hz* to 600 V *50 Hz*	0.15 % 0.18 %	
Voltage measurement	180 mV to 1 kV 130 mV *50 Hz* to 1 kV *50 Hz*	0.060 % + 180 mV 0.10 % + 130 mV	
High Voltage 50 Hz	1 kV to 7 kV 10 kV to 25 kV	0.25 % + 24 V 0.25 % +120 V	
High Voltage DC	1 kV to 10 kV 10 kV to 25 kV	0.060 % + 40 V 0.060 % + 120 V	
High Voltage Current 50 Hz	300 µA 3 mA 30 mA 300 mA	0.36 % + 3.4 µA 0.24 % + 8.5 µA 0.58 % + 27 µA 0.23 % + 180 µA	
High Voltage Current DC	300 µA 3 mA 30 mA 300 mA	0.36 % + 3.4 µA 0.24 % + 8.5 µA 0.58 % + 25 µA 0.23 % + 180 µA	
Loop impedance 50 Hz	10 mΩ to 90 mΩ 90 mΩ to 320 mΩ 320 mΩ to 490 mΩ 490 mΩ to 1 Ω 1 Ω to 5 Ω 5 Ω to 500 Ω 500 Ω to 1.8 kΩ	3.7 % + 18 mΩ 1.8 % + 18 mΩ 0.90 % + 23 mΩ 0.60 % + 24 mΩ 0.30 % + 43 mΩ 0.10 % + 200 mΩ 0.10 % + 24 Ω	
RCD Trip Current 50 Hz	1 mA to 30 mA 30 mA to 300 mA 300 mA to 3 A	0.20 % + 38 µA 0.20 % + 1.4 mA 0.20 % + 11 mA	
RCD Trip time	0 ms to 5 s	0.10 % + 4.7 ms	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (*k*=2)	Remarks
ELECTRICAL MEASUREMENTS (cont'd)			
PAT Insulation resistance	10 kΩ to 40 kΩ 40 kΩ to 200 kΩ 200 kΩ to 10 MΩ 10 MΩ to 1 GΩ 1 GΩ to 2 GΩ	200 ppm + 15 Ω 250 ppm + 15 Ω 500 ppm + 590 Ω 0.22 % + 120 kΩ 0.52 % + 120 kΩ	
Earth Bond resistance	0 Ω to 10 Ω 10 Ω to 1 kΩ	0.30 % + 40 mΩ 0.11 % + 200 mΩ	
Earth bond current	100 µA to 100 mA 100 mA to 20 A	4.0 mA 0.53 % + 32 mA	
Leakage current	1 µA to 30 mA	0.52 % + 20 µA	
Temperature simulation Thermocouple type			
K	-180 °C to 0 °C 0 °C to 1300 °C	0.16 °C 0.14 °C	Excluding internal reference junction compensation
J	-200 °C to 0 °C 0 °C to 1190 °C	0.15 °C 0.13 °C	
K	-180 °C to 0 °C 0 °C to 1300 °C	0.64 °C 0.63 °C	Including internal reference junction compensation
J	-200 °C to 0 °C 0 °C to 1190 °C	0.63 °C 0.63 °C	
Resistance thermometer simulation			
PT 100	-200 °C to 0 °C 0 °C to 850 °C	0.21 °C 0.21 °C	

END

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 µV

Over the range 100 mV to 1 V, the CMC is 0.0025 %·V + 5.0 µV, 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 $0.0036\ \%\cdot p + (0.12\cdot 10^{-6}\cdot p\cdot 10^{-6}) + 4.0$ 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 $1.5 \cdot 0.01 \cdot i$, where i is the instrument indication.