Schedule of Accreditation

issued by

United Kingdom Accreditation Service

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

4568

Accredited to ISO/IEC 17025:2017

The Sempre Group Ltd

Issue No: 016 **Issue date:** 15 July 2021

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Calibration performed by the Organisation at the locations specified

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
The Lodge 37 Barnett Way Barnwood Gloucestershire GL4 3RT	**Contact:** Mr T Butler Tel: +44 (0)1452 632712 Fax: +44 (0)1452 615352 E-Mail: tbutler@thesempregroup.com Website: www.thesempregroup.com	Electrical Calibration	A

Site activities performed away from the locations listed above:

Location details		Activity	Location code
At Customers premises	**Contact:** Mr T Butler Tel: +44 (0)1452 632712 Fax: +44 (0)1452 615352 E-Mail: tbutler@thesempregroup.com Website: www.thesempregroup.com	Dimensional Calibration	B

DETAIL OF ACCREDITATION

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
Electrical measurements described are made by comparison to, or transfer from a reference calibrator for the calibration of sourcing or measuring customer equipment				
ELECTRICAL				
DC Voltage	0 mV to 320 mV 0.32 V to 3.2 V 3.2 V to 32 V 32 V to 320 V 320 V to 1050 V	70 ppm + 5.0 µV 80 ppm + 50 µV 80 ppm + 500 µV 80 ppm + 5.3 mV 80 ppm + 24 mV	All **measurements** described below are made by comparison to or transfer from a reference calibrator.	A
AC Voltage	0 mV to 320 mV *10 Hz to 100 kHz*	0.23 % + 300 µV		A
	0.32 V to 3.2 V *10 Hz to 100 kHz*	0.23 % + 3.0 mV		
	3.2 V to 32 V *10 Hz to 100 kHz*	0.41 % + 37 mV		
	32 V to 105 V *10 Hz to 100 kHz*	0.41 % + 120 mV		
	105 V to 320 V *40 Hz to 30 kHz*	0.17 % + 74 mV		
	320 V to 800 V *40 Hz to 10 kHz*	930 ppm + 140 mV		
DC Current	0 µA to 320 µA 0.32 mA to 3.2 mA 3.2 mA to 32 mA 32 mA to 320 mA 0.32 A to 3.2 A 3.2 A to 10.5 A	190 ppm + 0.15 µA 190 ppm + 0.12 µA 240 ppm + 1.1 µA 210 ppm + 12 µA 710 ppm + 0.54 mA 670 ppm + 1.1 mA		A
AC Current	3.2 mA to 32 mA *10 Hz to 3 kHz*	850 ppm + 4.0 µA		A
	32 mA to 320 mA *10 Hz to 3 kHz*	980 ppm + 39 µA		
	0.32 A to 3.2 A *10 Hz to 10 kHz*	0.29 % + 3.0 mA		
	3.2 A to 10.5 A *10 Hz to 10 kHz*	0.58 % + 12 mA		A

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k = 2)	Remarks	Location Code
Electrical measurements described are made by comparison to, or transfer from a reference calibrator for the calibration of sourcing or measuring customer equipment				
Resistance	0 Ω to 40 Ω 40 Ω to 400 Ω 0.4 kΩ to 4 kΩ 4 kΩ to 40 kΩ 40 kΩ to 400 kΩ 0.4 MΩ to 4 MΩ 4 MΩ to 40 MΩ 40 MΩ to 400 MΩ	330 ppm + 13 mΩ 180 ppm + 23 mΩ 180 ppm + 93 mΩ 190 ppm + 930 mΩ 340 ppm + 9.5 Ω 640 ppm + 250 Ω 830 ppm + 2.6 kΩ 820 ppm + 87 kΩ		A
Frequency	0.5 Hz to 10 MHz	30 ppm + 6.0 Hz		A
DIMENSIONAL MEASURING INSTRUMENTS AND MACHINES				
Performance verification of cartesian co-ordinate measuring machines equipped with imaging probing systems using the component approach.	ISO 10360-7:2011 - CMM's length measurements over the following test lengths: E_{BXY} 0 mm to 1500 mm E_{UZ} 0 mm to 515 mm E_{BV} 0 mm to 6 mm Probing performance: P_{F2D} using a 25 mm diameter artefact P_{FV2D} using a 2 mm diameter artefact Squareness: E_{SQ} 0 mm to 400 mm	 1.5 + (3.1 x length in m) µm 1.6 + (3.0 x length in m) µm 1.2 µm 6.9 µm 1.3 µm 3.8 µm	All linear calibrations may be given in inch units.	B
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.