Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

4382
Accredited to ISO/IEC 17025:2017

James Fisher Nuclear Limited

Issue No: 013 **Issue date**: 08 March 2021

Unit 64, 65,
3rd Avenue,
Zone 2
Deeside Industrial Estate
Flintshire
CH5 2LA

Contact: Philip Pook
Tel: +44 (0)1244 283 892
E-Mail: Philip.Pook@jfnl.co.uk
Website: www.jfnl.co.uk

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
Surface contamination response. Complying with statutory tests given in GPG14 including Tests before First Use	Alpha emitting nuclides Americium-241 Thorium-230 Uranium-234/238 Plutonium-239	7.8 %	Calibration of portable surface contamination instruments using large area sources with surface emission rates traceable to national standards.
	Beta emitting nuclides Chlorine-36 Carbon-14 Strontium-90 / Yttrium-90 Cobalt-60 Caesium-137 Technetium-99	6.8 %	
Air kerma rate	Americium-241 52 µGy.h^{-1} to 618 µGy.h^{-1}	7.2 %	Calibration and testing of air kerma/air kerma rate monitors using air kerma rates traceable to national standards through a secondary standard dosemeter.
	Caesium-137 0.2 µGy.h^{-1} to 1.8 Gy.h^{-1}	4.4 %	
	Cobalt-60 65 µGy.h^{-1} to 2.8 mGy.h^{-1}	4.6 %	
Ambient dose equivalent H*(10)	Americium-241 90 µSv.h^{-1} to 1.1 mSv.h^{-1}	7.2 %	Calibration and testing of dose/dose rate monitors using air kerma rates traceable to national standards through a secondary standard dosemeter and using appropriate coefficients given in ISO Standards for H*(10).
	Caesium-137 0.2 µSv.h^{-1} to 2.2 Sv.h^{-1}	4.4 %	
	Cobalt-60 75 µSv.h^{-1} to 3.3 mSv.h^{-1}	4.6 %	
Personal dose equivalent Hp(10)	Americium-241 98 µSv.h^{-1} to 1.2 mSv.h^{-1}	7.2 %	Calibration and testing of electronic personal dosemeters using air kerma rates traceable to national standards through a secondary standard dosemeter, and using appropriate coefficients given in ISO Standards for Hp(10). Measurement uncertainties are dependent upon the exposure method used. The stated uncertainties are the best achievable using collimated sources.
	Caesium-137 0.2 µSv.h^{-1} to 2.2 µSv.h^{-1}	4.4 %	
	Cobalt-60 74 µSv.h^{-1} to 3.3 mSv.h^{-1}	4.6 %	

Measured Quantity Instrument or Gauge	Range	Calibration and Measurement Capability (CMC) Expressed as an Expanded Uncertainty (k=2)	Remarks
Alpha, beta and photon large area sources			
Measurement of surface emission rates s^{-1}	Alpha emitting nuclides Americium-241 Thorium-230 Plutonium-239 Uranium-234/238	5.8 %	Measurement of surface emission rates from planar sources using a windowed gas-flow proportional counter, calibrated with extended reference sources of the same nuclide. The measurement uncertainties are dependent upon the nuclide and surface emission rate. The stated values are the best achievable.
	Beta emitting nuclides Chlorine-36 Carbon-14 Strontium-90/Yttrium-90 Cobalt-60 Caesium-137	6.5 %	
	Electron Capture nuclides Iron-55	11.6 %	

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, and an indication of how they are to be interpreted, are shown below.

<u>DC voltage, 100 mV to 1 V:</u> 0.0025 % + 5.0 µV:

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

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

Over the range 0.5 MPa to 140 MPa, the CMC is 0.0036 %$\cdot p$ + $(0.12\cdot10^{-6}\cdot p\cdot10^{-6})$ + 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.