

Accreditation Certificate

Butler Technologies

Unit 14, Block G, Maynooth Business Campus, Co. Kildare, Ireland

Calibration Laboratory

Registration number: 256C

is accredited by the Irish National Accreditation Board (INAB) to undertake calibration as detailed in the Schedule bearing the Registration Number detailed above, in compliance with the International Standard ISO/IEC 17025:2005 2nd Edition

“General Requirements for the Competence of Testing and Calibration Laboratories”

(This Certificate must be read in conjunction with the annexed Schedule of Accreditation)

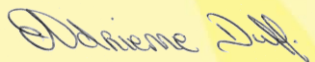
Date of award of accreditation: 12:03:2010

Date of last renewal of accreditation: 09:01:2013

Expiry date of this certificate of accreditation: 09:01:2018

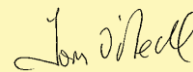
This Accreditation shall remain in force until further notice subject to continuing compliance with INAB accreditation criteria, ISO/IEC 17025 and any further requirements specified by the Irish National Accreditation Board.

Manager:



Dr Adrienne Duff

Chairperson:



Mr Tom O'Neill

Issued on 14 March 2016

Organisations are subject to annual surveillance and are re-assessed every five years. The renewal date on this Certificate confirms the latest date of renewal of accreditation. To confirm the validity of this Certificate, please contact the Irish National Accreditation Board.

INAB is a signatory of the European co-operation for Accreditation (EA) Testing Multilateral Agreement (MLA) and the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement.

Schedule of Accreditation



(Annex to Accreditation Certificate)

Permanent Laboratory:
Category A, B

BUTLER TECHNOLOGIES

Electrical /Temperature / Pressure / Torque Calibration Laboratory

Initial Accreditation Date : 12 March 2010 (Electrical)
12-March-2010 (Temperature)
12-March-2010 (Pressure)
05-April-2011 (Torque)

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Facilities: Public calibration service

Schedule of Accreditation



Permanent Laboratory:
Category A, B

THE IRISH NATIONAL ACCREDITATION BOARD (INAB) is the Irish body for the accreditation of organisations including laboratories.

Laboratory accreditation is available to testing and calibration facilities operated by manufacturing organisations, government departments, educational institutions and commercial testing/calibration services. Indeed, any organisation involved in testing, measurement or calibration in any area of technology can seek accreditation for the work it is undertaking.

Each accredited laboratory has been assessed by skilled specialist assessors and found to meet criteria which are in compliance with ISO/IEC 17025 or ISO/IEC 15189 (medical laboratories). Frequent audits, together with periodic inter-laboratory test programmes, ensure that these standards of operation are maintained.

Calibration Categories:

- Category A:** Permanent calibration laboratory where the laboratory is erected on a fixed location for a period expected to be greater than three years.
- Category B:** Site calibration that is performed by staff sent out on site by a permanent laboratory that is accredited by the Irish National Accreditation Board.
- Category C:** Site calibration that is performed in a site/mobile laboratory or by staff sent out by such a laboratory, the operation of which is the responsibility of a permanent laboratory accredited by the Irish National Accreditation Board.
- Category D:** Site calibration that is performed on site by individuals and organisations that do not have a permanent calibration laboratory. Calibration may be performed using
- portable test equipment
 - a site laboratory
 - a mobile laboratory or
 - equipment from a mobile or site laboratory

Standard Specification or Calibration Procedure Used:

The standard specification or calibration procedure that is accredited is the issue that is current on the date of the most recent visit, unless otherwise stated.

Glossary of Terms

Facilities:

- Public calibration service:** Commercial operations which actively seek work from others.
- Conditionally available for public calibration:** Established for another primary purpose but, more commonly than not, is available for outside work.
- Normally not available for public calibration:** Unavailable for public calibration more often than not.

Laboratory users wishing to obtain assurance that calibration results are reliable and carried out to the Irish National Accreditation Board criteria should insist on receiving an accredited calibration certificate. Users should contact the laboratory directly to ensure that this schedule of accreditation is current. INAB will on request verify the status and scope.

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: $23 \pm 2^\circ\text{C}$)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
DC Voltage Up to 200 m V 0.2 V to 2 V 2 V to 20V 20 V to 200 V 200 V to 1000 V 1 k V to 6 k V		$\pm 3.5 \mu\text{V}$ $\pm 3.5 \mu\text{V}$ to $15 \mu\text{V}$ $\pm 15 \mu\text{V}$ to $120 \mu\text{V}$ $\pm 150 \mu\text{V}$ to $190 \mu\text{V}$ $\pm 2.2 \text{ m V}$ to 9.7 m V $\pm 2.5 \text{ V}$ to 15 V	Measure & Generate CTM-101-103, 115, 116 ('CTM' = Butler Transtest in-house 'Common Test Method')
AC Voltage 20 m V to 200 m V 20 m V to 200 m V 20 m V to 200 m V 20 m V to 200 m V 200 m V to 2 V 200 m V to 2 V 200 m V to 2 V 200 m V to 2 V 2 V to 20V 2 V to 20V 2 V to 20V 2 V to 20V	100Hz to 2kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz 100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz 100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz	$\pm 4.8 \mu\text{V}$ to $28 \mu\text{V}$ $\pm 7 \mu\text{V}$ to $30 \mu\text{V}$ $\pm 80 \mu\text{V}$ to $160 \mu\text{V}$ $\pm 40 \mu\text{V}$ to $200 \mu\text{V}$ $\pm 38 \mu\text{V}$ to $180 \mu\text{V}$ $\pm 42 \mu\text{V}$ to $220 \mu\text{V}$ $\pm 92 \mu\text{V}$ to $520 \mu\text{V}$ $\pm 360 \mu\text{V}$ to 1.5 m V $\pm 0.4 \text{ m V}$ to 2.2 m V $\pm 0.42 \text{ m V}$ to 2.4 m V $\pm 0.94 \text{ m V}$ to 5.2 m V $\pm 3.4 \text{ m V}$ to 14 m V	Measure & Generate CTM-101-103, 115, 116

*** Notes:**

- In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
- Calibration & measurement capability expressed as an uncertainty (\pm) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
AC Voltage 20 V to 200 V 20 V to 200 V 20 V to 200 V 20 V to 200 V 200 V to 1000 V 200 V to 1000 V 200 V to 1000 V 1 k V to 6 k V	100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz 100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 50 Hz	± 4 mV to 24 mV ± 4.4 mV to 26 mV ± 4.9 mV to 54 mV ± 34 mV to 150 mV ± 34 mV to 130 mV ± 34 mV to 130 mV ± 72 mV to 270 mV ± 4 V to 24V	Measure to 6kV Generate to 3kV
Resistance Up to 2Ω 2Ω to 20Ω 20Ω to 200Ω 200Ω to 2 kΩ 2 kΩ to 20 kΩ 20 kΩ to 200 kΩ 200 kΩ to 2MΩ 2 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 1 GΩ 1 GΩ 10 GΩ 100 GΩ 1 TΩ		± 20 μΩ to 56 μΩ ± 54 μΩ to 340 μΩ ± 300 μΩ to 2.2 mΩ ± 2.6 mΩ to 18 mΩ ± 25 mΩ to 180 mΩ ± 250 mΩ to 1.8 Ω ± 4.7Ω to 32 Ω ± 1kΩ to 17 kΩ ± 120 kΩ to 180 kΩ ± 12 MΩ to 14 MΩ ± 20 MΩ ± 200 MΩ ± 2.5 GΩ ± 30 GΩ	Measure & Generate CTM-111, 112 Generate CTM-112H

*** Notes:**

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- Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
DC Current 20 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 100 A		± 1.3 nA to 10 nA ± 11 nA to 75 nA ± 110 nA to 750 nA ± 2.4 µA to 13 µA ± 58 µA to 480 µA ± 1 mA to 50 mA	Measure & Generate CTM-105,107,108 Generate to 10A
AC Current 20 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 100 A	10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 1 kHz 40 Hz to 400 Hz	±28 nA to 80 nA ±280 nA to 800 nA ±2.8 µA to 8 µA ±28 µA to 88 µA ±0.6 mA to 2 mA ±7 mA to 350 mA	Measure & Generate CTM-105,107,108 Generate to 50A
Phase 0 to ±360°	40 Hz to 100 kHz	±0.95°	For waveforms > 200 mV CTM-161

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Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty **	Method and remarks
LF Distortion 0 to -40 dB -40 to -60 dB -60 to -80 dB -80 to -90 dB	100 Hz to 100 kHz 100 Hz to 100 kHz 100 Hz to 100 kHz 100 Hz to 100 kHz	±0.7 dB ±0.8 dB ±2.4 dB ±5 dB	By rss addition of harmonics CTM-154
Frequency 0.03 Hz to 3 kHz 3 kHz to 30 kHz 30 kHz to 300 kHz 300 kHz to 30 MHz 30 MHz to 1.3 GHz 1.3 MHz to 18 GHz		±0.45mHz to 4.5mHz ±0.48mHz to 4.8mHz ±0.45mHz to 51mHz ±0.6 mHz to 60 mHz ±42 mHz to 1.8 Hz ±1.8 Hz to 25 Hz	CTM-114/301/302/303 310/311
Time 1 us up		±33 ns	CTM-163
RF Power 0 dBm / 1 mW -70 dBm to -60 dBm -60 dBm to -50 dBm -50 dBm to -40 dBm -40 dBm to -20 dBm	At 50 MHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz	± 1.0% or 0.043 dB ± 0.68 dB to 0.58 dB ± 0.50 dB to 0.17 dB ± 0.23 dB to 0.13 dB ± 0.16 dB to 0.13 dB	Measure Into 50 Ohms CTM-1010,1011,1012 Type 'N' (f) connectors Other connectors will increase uncertainty
<p>* Notes:</p> <ol style="list-style-type: none"> In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration". 			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
RF Power Level 0 dBm to -30 dBm -30 dBm to -40dBm -40 dBm to -50 dBm -50 dBm to -60 dBm -60 dBm to -70 dBm -70 dBm to -80 dBm -80 dBm to -90 dBm -90 dBm to -100 dBm -100 dBm to -110 dBm -110 dBm to -127dBm	2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz	±0.11 dB ±0.12 dB ±0.15 dB ±0.16 dB ±0.18 dB ±0.20 dB ±0.24 dB ±0.26 dB ±0.28 dB ±0.34 dB	50 Ohm system Type N connectors Other connectors will increase uncertainty Appropriate to the calibration of sources and receivers CTM-1004,1005,1007,1008
RF Power -20 dBm to +10 dBm -20 dBm to +10 dBm -20 dBm to +10 dBm -30 dBm to +10 dBm -30 dBm to +10 dBm -30 dBm to +10 dBm 10 dBm to + 50 dBm 10 dBm to +40 dBm 10 dBm to +49.5 dBm 10 dBm to +47 dBm	10 MHz to 30 MHz 30 MHz to 1 GHz 30 MHz to 3 GHz 200 kHz to 500 kHz 500 kHz to 50 MHz 50 MHz to 3 GHz 10 MHz to 1 GHz 10 MHz to 2G Hz 10 MHz to 100 MHz 101 MHz to 400 MHz	±3.4% or 0.15 dB ±2.6% or 0.11 dB ±3% or 0.13 dB ±3.5% or 0.15 dB ±3.3% or 0.14 dB ±3.3% or 0.14 dB ±4% or 0.17 dB ±4% or 0.17 dB ±4% or 0.17 dB ±4% or 0.17 dB	Generate CTM-1012

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
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Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty **	Method and remarks
RF Attenuation 1 dB to 49 dB 50 dB to 79 dB 80 dB to 90 dB 90 dB to 95 dB 95 dB to 100 dB 1 dB to 49 dB 50 dB to 79 dB 80 dB to 90 dB 90 dB to 95 dB 95 dB to 100 dB	1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz	±0.32 dB ±0.45 dB ±0.9 dB ±1.4 dB ±2.6 dB ±0.42 dB ±0.48 dB ±1.3 dB ±1.9 dB ±2.7 dB	50 Ohm system Instrument input attenuators CTM-1006 50 Ohm system Instrument output attenuators CTM-1007,1008
VRC 0.7 to 0.18 0.18 to 0.013 0.7 to 0.18 0.18 to 0.013	300 kHz to 1 GHz 300 kHz to 1 GHz 1 GHz to 3 GHz 1 GHz to 3 GHz	±0.016 ±0.012 ±0.018 ±0.014	Type 'N' (f) Other connectors will increase uncertainty CTM-1053/1054
Amplitude Modulation 5% to 95%	10 MHz to 2.4 GHz fcar. 300 Hz to 20 kHz fmod.	±0.1%	For low distortion modulation waveforms CTM-1025
* Notes: 1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%. 2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
Frequency Modulation 250 Hz to 250 kHz fd	10 MHz to 2.4 GHz fcar. 300 Hz to 20 kHz fmod.	±0.3 Hz to 300 Hz	For low distortion modulation waveforms CTM-1030, 1031
RF Voltage 1V ±10%	1 kHz to 50 kHz 50 kHz to 500 kHz 500 kHz to 5 MHz 5 MHz to 20 MHz	±1.2 mV ±1.3 mV ±1.5 mV ±2.8 mV	Measurement in 50 Ohm system CTM-166
Risetime	Down to 25 ps 130 ps	± (6% + 10pS) ±13 ps	Measurement in 50 Ohm system Repetitive waveform generation in a 50 Ohm system CTM-211, 214,1064
<p>* Notes:</p> <ol style="list-style-type: none"> In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration". 			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
Oscilloscopes Risetime	Oscilloscope bandwidth Up to 250 MHz 250 to 350 MHz 350 to 450 MHz 450 to 550 MHz 550 to 650 MHz 650 to 740 MHz 750 to 1 GHz	±0.63 MHz to 1.6MHz ±1.6 MHz to 2.2 MHz ±2.2 MHz to 3 MHz ±3 MHz to 3.7 MHz ±3.7 MHz to 5 MHz ±5 MHz to 6.5 MHz ±6.5 MHz to 100MHz	Measurement in 50 Ohm system Oscilloscope bandwidth calculated using $0.35 = tr/bw$ assuming the oscilloscope input to be Gaussian CTM-217,218
Vertical Deflection 100 uV to 100 V		±5.4 µV to 400 mV	CTM-202/203
Horizontal Deflection 1s to 1ns		±3 ms to 30 ps	CTM-206/207
Loop Resistance (@ 50 Hz)	0 to 1.0 Ω 1.0 to 5.0 Ω 5.0 to 10.0 Ω 10.0 to 100.0 Ω 100 to 1000 Ω	±0.015 Ω ±0.034 Ω ± 0.063 Ω ± 0.590 Ω ± 5.80 Ω	Generated using dedicated electrical test equipment calibrator (Method per calibrator manual)

*** Notes:**

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- Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
RCD Trip Current (@ 50 Hz)	0 to 10 mA	±0.2 mA	Measured using dedicated electrical test equipment calibrator (Method per calibrator manual)
	10 mA to 30 mA	±0.5 mA	
	30 mA to 90 mA	±1.3 mA	
	90 mA to 100 mA	±1.5 mA	
	100 mA to 110 mA	±1.6 mA	
	110 mA to 300 mA	±4.9 mA	
	300 ma to 1000 mA	±15 mA	
1000 mA to 2000mA	±29 mA		
RCD Trip Time (@ 50 Hz)	20 ms to 1000 ms	±1.2 ms	Measured using dedicated electrical test equipment calibrator (Method per calibrator manual)

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
302	Resistors, resistance boxes & potential dividers	
.01		Precision resistors, resistance boxes and conductance boxes
.02		Volt ratio boxes and potential dividers
.03		DC shunts
.04		AC shunts
303	Insulating materials & insulators	Insulation resistance tests
.02		Direct voltage tests
.06		Alternating voltage tests
.07		
307	Voltage standards	Standard cells
.01		Electronic e.m.f. reference devices
.11		
308	Precision transfer instruments	
.01		A.C./D.C. transfer instruments
309	Instrument calibrators	
.01		D.C. voltage
.02		A.C. voltage
.03		DC current
.04		AC current
.51		Resistance

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
310	Indicating and recording instruments	
.01		D.C. voltmeters
.02		A.C. voltmeters
.03		D.C. ammeters
.04		A.C. ammeters
.05		Wattmeters
.06		Varimeters
.07		Phase angle indicators
.08		Power factor meters
.09		Ohmmeters
.10		LCR meters
.11		Galvanometers and null detectors
.21		Electricity meters
.81		Graphic recording instruments
311	Bridges, potentiometers, test sets	
.01		D.C. bridges
.02		D.C. potentiometers
.11		A.C. bridges
.12		A.C. potentiometers
.21		Ratiometers
.31		Current transformer testing sets
.32		Voltage transformer testing sets

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
312	Frequency & time measuring instruments & standards	
.01		Frequency meters
.02		Wavemeters
.11		Counters
.12		Time interval-meters
.13		Clocks and watches
.15		Tachometers
.21		Frequency standards
313	Waveform measuring instruments	
.01		Frequency characteristics
.02		Input characteristics
.03		Timing characteristics
.04		Distortion
321	Power supplies and stabilizers	
.01		Power supplies
.02		Stabilizers

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
322	Signal sources	
.01	Frequency characteristics	
.02	Output characteristics	
.03	Modulation characteristics	
.04	Sweep characteristics	
325	Communications equipment	
.01		Line transmission measuring equipment
.02		Radio transmission measuring equipment
.03		Field intensity measuring equipment
.04		Electrical noise and interference measuring equipment
.05		Impedance and reflection measuring equipment
.06		Spectrum analysis measuring equipment
.07		Data transmission equipment
.08		Power measuring equipment
.09		Attenuators and amplifiers
.12		Communications systems
.13		Data acquisition systems
340	High voltage testing	
.11		Direct voltage tests
.12		Alternating voltage tests
365	Miscellaneous electrical measuring equipment	
.99		Other tests - calibration of electrical installation testers (Loop impedance, insulation, RCD).

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
501	Calibration of temperature measuring equipment	
.02		Base metal thermocouples
.03		Temperature fixed points
.05		Metallic resistance thermometers
.06		Semi-conductor thermometers
.41		Digital temperature indicator system

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
501 Calibration of temperature measuring equipment			Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3027
.02 Base metal thermocouples	-95 °C to +600 °C	±0.3 °C to 1.3 °C	
.05 Metallic resistance thermometers	-95 °C to +600 °C	±0.051 °C to 0.1 °C	Measurement of RTD output at specified temperatures and immersion depths
	Water Triple Point (0.01 °C)	± 0.005 °C	
	Gallium Melt Point (29.7646 °C)	± 0.005 °C	
.41 Digital temperature indicator system	-95 °C - -40 °C	± 0.1 °C	Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3027
	-40 to -20 °C	± 0.066 °C	
	-20 to +150 °C	± 0.019 °C	
	+150 to +200 °C	± 0.05 °C	
	+200 to +300 °C	± 0.1 °C	
	+300 to +400 °C	± 0.1 °C	
	+400 to +500 °C	± 0.1 °C	
+500 to +600 °C	± 0.1 °C		

*** Notes:**

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2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
501 Calibration of temperature measuring equipment			Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3027
.02 Base metal thermocouples	-80 °C @ CO2 sublimation point	±0.05 °C	
.05 Metallic resistance thermometers	-80 °C @ CO2 sublimation point	±0.05 °C	Measurement of RTD output at specified temperatures and immersion depths
.41 Digital temperature indicator system	-80 °C @ CO2 sublimation point	±0.05 °C	Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3027

*** Notes:**

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Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
503 Calibration of ancillary temperature measuring instruments			CTM-3027
.01 Portable potentiometers	-200 °C to +1750 °C	±0.14 °C to 0.59 °C	Calibration of indicators using emf injection (for thermocouple types E, J, K, N, R, T). Calibration of indicators using resistance
.02 Digital voltmeters			
.03 Resistance bridges			
.04 Indicators, recorders and Controllers	-200 °C to +600 °C	±0.06 °C to 0.12 °C	
.90 Other equipment <i>Lab-inserted text</i>			
510 Testing of temperature controlled enclosures			Direct measurement of ovens, furnaces, dry and wet baths with suitable immersion depth (>100mm). This includes the calibration of Dry Block Calibrators.
.01 Ovens, furnaces & baths	-95 °C to 600 °C	±.042 °C to 0.65 °C	CTM-3004
.02 Incubators	0 °C to +70 °C	±0.1 °C	
.03 Autoclaves and sterilising ovens (excluding autoclaves)	+100 °C to +140 °C	±0.5 °C	
.04 Industrial freezers (Fridge-freezers)	-95 °C to +10 °C	±0.05 °C	CTM-3040

*** Notes:**

- In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
- Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Temperature Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
503	Calibration of ancillary temperature measuring instruments	
.01		Portable potentiometers
.02		Digital voltmeters
.03		Resistance bridges
.04		Indicators, recorders and controllers
510	Testing of temperature measuring instruments	
.01		Ovens, furnaces and baths
.02		Incubators
.03		Sterilising ovens
.04		Industrial freezers (Fridge-freezers)

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Pressure Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
140 Barometers - Barometric Pressure	Barometric pressure 50 kPa to 110 kPa	± 23 Pa	CTM-6005
141 Pressure and vacuum measuring devices - Generation by Pressure Calibrators:-	Gauge pressure 0 to 1000 Pa 1000 Pa to 200 kPa 200 kPa to 2 MPa Negative gauge pressure (vacuum) 0 to -1000 Pa Hydraulic pressure 0 To 350 kPa 350 kPa to 58.6 MPa	± 1.4 Pa ± 0.025% + 120 Pa ± 0.024% + 590 Pa ± 1.4 Pa ± 730 Pa ± 0.12% Pa	CTM-6015 /6016/6012 CTM-6012, 6015 /6016 CTM-6030

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Pressure Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
141 Pressure and vacuum measuring devices - Generation by Deadweight Tester	Gauge pressure 3.5 kPa to 10 kPa	± 0.0088% + 0.9 Pa	CTM-6003 / 6019
	10 kPa to 20 kPa	± 0.0068%	
	20 kPa to 2.5 MPa 2.5 MPa to 12 MPa	± 0.0048% ± 0.008%	
	Negative gauge pressure (vacuum) -3.5 kPa to -90 kPa	± 0.0098% + 0.9 Pa	CTM-6004
	Absolute pressure 5 kPa to 200 kPa	± 0.01% - + 23 Pa	CTM-6007

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Pressure Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
140	Barometers	
.01		Aneroid barometers
.04		Gauge barometers
141	Pressure and vacuum measuring devices	
.01		Pressure gauges
.02		Vacuum gauges
.11		Pressure transducers
.12		Pressure recorders
.23		Digital manometers

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Torque Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
152 Torque measuring devices			
.01 Torque wrenches (incl. screwdrivers)	0.5 N·m to 5 N·m	± 1.6%	CTM-4005 / CTM-4006
	5 N·m to 1000 N·m	± 1.6%	CTM-4005 / CTM-4006
<p>* Notes:</p> <p>1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.</p> <p>2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".</p>			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category A

Torque Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)	Instrument
152 Torque measuring devices .01	Torque wrenches (incl. screwdrivers)

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
DC Voltage Up to 200 mV 0.2 V to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V 1 kV to 6 kV		± 3.5 µV ± 3.5 µV to 15 µV ± 15 µV to 120 µV ± 150 µV to 190 µV ± 2.2 mV to 9.7 mV ± 2.5 V to 15 V	Measure & Generate CTM-103
AC Voltage 20 mV to 200 mV 20 mV to 200 mV 20 mV to 200 mV 20 mV to 200 mV 200 mV to 2 V 200 mV to 2 V 200 mV to 2 V 200 mV to 2 V 2 V to 20 V 2 V to 20 V 2 V to 20 V 2 V to 20 V	100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz 100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz 100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz	± 4.8 µV to 28 µV ± 7 µV to 30 µV ± 80 µV to 160 µV ± 40 µV to 200 µV ± 38 µV to 180 µV ± 42 µV to 220 µV ± 92 µV to 520 µV ± 360 µV to 1.5 mV ± 0.4 mV to 2.2 mV ± 0.42 mV to 2.4 mV ± 0.94 mV to 5.2 mV ± 3.4 mV to 14 mV	Measure & Generate CTM-103
* Notes: 1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%. 2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
AC Voltage 20 V to 200 V 20 V to 200 V 20 V to 200 V 20 V to 200 V 200 V to 1000 V 200 V to 1000 V 200 V to 1000 V 1 kV to 6 kV	100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 30 kHz to 100 kHz 100 Hz to 2 kHz 40 Hz to 10 kHz 10 kHz to 30 kHz 50 Hz	± 4 mV to 24 mV ± 4.4 mV to 26 mV ± 4.9 mV to 54 mV ± 34 mV to 150 mV ± 34 mV to 130 mV ± 34 mV to 130 mV ± 72 mV to 270 mV ± 4 V to 24V	Measure to 6kV Generate to 3kV ('CTM' = Butler Transtest in-house 'Common Test Method')
Resistance Up to 2Ω 2Ω to 20Ω 20Ω to 200Ω 200Ω to 2 kΩ 2 kΩ to 20 kΩ 20 kΩ to 200 kΩ 200 kΩ to 2 MΩ 2 MΩ to 20 MΩ 20 MΩ to 200 MΩ 200 MΩ to 1 GΩ		± 20 μΩ to 56 μΩ ± 54 μΩ to 340 μΩ ± 300 μΩ to 2.2 mΩ ± 2.6 mΩ to 18 mΩ ± 25 mΩ to 180 mΩ ± 250 mΩ to 1.8 Ω ± 4.7Ω to 32 Ω ± 1kΩ to 17 kΩ ± 120 kΩ to 180 kΩ ± 12 MΩ to 14 MΩ	Measure & Generate CTM-112

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
Resistance 1 GΩ 10 GΩ 100 GΩ 1 TΩ		± 20 MΩ ± 200 MΩ ± 2.5 GΩ ± 30 GΩ	Generate CTM-112
DC Current 20 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 100 A		± 1.3 nA to 10 nA ± 11 nA to 75 nA ± 110 nA to 750 nA ± 2.4 µA to 13 µA ± 58 µA to 480 µA ± 1 mA to 50 mA	Measure & Generate CTM-107/108 Generate to 10A
AC Current 20 µA to 200 µA 200 µA to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A 2 A to 100 A	10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 5 kHz 10 Hz to 1 kHz 40 Hz to 400 Hz	±28 nA to 80 nA ±280 nA to 800 nA ±2.8 µA to 8 µA ±28 µA to 88 µA ±0.6 mA to 2 mA ±7 mA to 350 mA	Measure & Generate CTM-107/108 Generate to 50A
* Notes: 1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%. 2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
Phase 0 to ±360°	40 Hz to 100 kHz	±0.95°	For waveforms > 200 mV CTM-161
Peak to Peak Voltage 0.1 V to 10 V	1 kHz to 5 MHz	±300 µV to 30 mV	CTM-167
LF Distortion 0 to -40 dB -40 to -60 dB -60 to -80 dB -80 to -90 dB	100 Hz to 100 kHz 100 Hz to 100 kHz 100 Hz to 100 kHz 100 Hz to 100 kHz	±0.7 dB ±0.8 dB ±2.4 dB ±5 dB	By rss addition of harmonics CTM-154
Frequency 0.03 Hz to 3 kHz 3 kHz to 30 kHz 30 kHz to 300 kHz 300 kHz to 30 MHz 30 MHz to 1.3 GHz 1.3 MHz to 18 GHz		±0.45 mHz to 4.5 mHz ±0.48 mHz to 4.8 mHz ±0.45 mHz to 51 mHz ±0.6 mHz to 60 mHz ±42 mHz to 1.8 Hz ±1.8 Hz to 25 Hz	CTM-114/301/302/310/31
Time 1 us up		±33 ns	CTM-163

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
RF Power 0 dBm / 1 mW -70 dBm to -60 dBm -60 dBm to -50 dBm -50 dBm to -40 dBm -40 dBm to -20 dBm	At 50 MHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz	± 1.0% or 0.043 dB ± 0.68 dB to 0.58 dB ± 0.50 dB to 0.17 dB ± 0.23 dB to 0.13 dB ± 0.16 dB to 0.13 dB	Measure Into 50 Ohms Type 'N' (f) connectors Other connectors will increase uncertainty CTM-1010
RF Power Level 0 dBm to -30 dBm -30 dBm to -40dBm -40 dBm to -50 dBm -50 dBm to -60 dBm -60 dBm to -70 dBm -70 dBm to -80 dBm -80 dBm to -90 dBm -90 dBm to -100 dBm -100 dBm to -110 dBm -110 dBm to -127 dBm	2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz 2.5 MHz to 1.3 GHz	±0.11 dB ±0.12 dB ±0.15 dB ±0.16 dB ±0.18 dB ±0.20 dB ±0.24 dB ±0.26 dB ±0.28 dB ±0.34 dB	50 Ohm system Type N connectors Other connectors will increase uncertainty Appropriate to the calibration of sources and receivers
* Notes: 1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%. 2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
RF Power -20 dBm to +10 dBm -20 dBm to +10 dBm -20 dBm to +10 dBm -30 dBm to +10 dBm -30 dBm to +10 dBm	10 MHz to 30 MHz 30 MHz to 1 GHz 30 MHz to 3 GHz 200 kHz to 500 kHz 500 kHz to 50 MHz	±3.4% or 0.15 dB ±2.6% or 0.11 dB ±3% or 0.13 dB ±3.5% or 0.15 dB ±3.3% or 0.14 dB	Generate
RF Attenuation 1 dB to 49 dB 50 dB to 79 dB 80 dB to 90 dB 90 dB to 95 dB 95 dB to 100 dB 1 dB to 49 dB 50 dB to 79 dB 80 dB to 90 dB 90 dB to 95 dB 95 dB to 100 dB	1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz 1 kHz to 1 GHz	±0.32 dB ±0.45 dB ±0.9 dB ±1.4 dB ±2.6 dB ±0.42 dB ±0.48 dB ±1.3 dB ±1.9 dB ±2.7 dB	50 Ohm system Instrument input attenuators CTM-1006 50 Ohm system Instrument output attenuators CTM-1007
<p>* Notes:</p> <p>1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.</p> <p>2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".</p>			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
VRC 0.7 to 0.032 0.7 to 0.18 0.18 to 0.0 0.7 to 0.18 0.18 to 0.0	100 kHz to 300 kHz 300 kHz to 1 GHz 300 kHz to 1 GHz 1 GHz to 3 GHz 1 GHz to 3 GHz	±0.034 ±0.016 ±0.012 ±0.018 ±0.014	50 Ohm system BNC (f) Type 'N' (f) Other connectors will increase uncertainty CTM-1053/1054
Amplitude Modulation 5% to 95%	10 MHz to 2.4 GHz fcar 300 Hz to 20 kHz fmod	±0.4%	For low distortion modulation waveforms CTM-1021/1022
Frequency Modulation 250 Hz to 250 kHz fd	10 MHz to 2.4 GHz fcar 300 Hz to 20 kHz fmod	±0.3 Hz to 300 Hz	For low distortion modulation waveforms CTM-1031

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
RF Voltage 1V ±10%	1 kHz to 50 kHz 50 kHz to 500 kHz 500 kHz to 5 MHz 5 MHz to 20 MHz	±1.2 mV ±1.3 mV ±1.5 mV ±2.8 mV	Measurement in 50 Ohm system CTM-166/1201
Risetime	Down to 25 ps 130 ps	± (6% + 10ps) ±13 ps	Measurement in 50 Ohm system Repetitive waveform generation in a 50 Ohm system CTM-1061/2/3
Oscilloscopes Risetime	Oscilloscope bandwidth Up to 250 MHz 250 to 350 MHz 350 to 450 MHz 450 to 550 MHz 550 to 650 MHz 650 to 740 MHz 750 to 1 GHz	±0.63 MHz to 1.6MHz ±1.6 MHz to 2.2 MHz ±2.2 MHz to 3 MHz ±3 MHz to 3.7 MHz ±3.7 MHz to 5 MHz ±5 MHz to 6.5 MHz ±6.5 MHz to 100 MHz	Measurement in 50 Ohm system Oscilloscope bandwidth calculated using $0.35 = tr/bw$ assuming the oscilloscope input to be Gaussian

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
Vertical Deflection 100 uV to 100 V		±5.4 µV to 400 mV	CTM-202/203
Horizontal Deflection 1s to 1ns		±3 ms to 30 ps	CTM-206/207
Loop Resistance (@ 50 Hz)	0 to 1.0 Ω 1.0 to 5.0 Ω 5.0 to 10.0 Ω 10.0 to 100.0 Ω 100 to 1000 Ω	±0.015 Ω ±0.034 Ω ± 0.063 Ω ± 0.590 Ω ± 5.80 Ω	Generated using dedicated electrical test equipment calibrator (Method per calibrator manual)
RCD Trip Current (@ 50 Hz)	0 to 10 mA 10 mA to 30 mA 30 mA to 90 mA 90 mA to 100 mA 100 mA to 110 mA 110 mA to 300 mA 300 ma to 1000 mA 1000 mA to 2000 mA	±0.2 mA ±0.5 mA ±1.3 mA ±1.5 mA ±1.6 mA ±4.9 mA ±15 mA ±29 mA	Measured using dedicated electrical test equipment calibrator (Method per calibrator manual)
RCD Trip Time (@ 50 Hz)	20 ms to 1000 ms	±1.2 ms	Measured using dedicated electrical test equipment calibrator (Method per calibrator manual)

*** Notes:**

- In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
- Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
302	Resistors, resistance boxes and potential dividers	
.01		Precision resistors, resistance boxes and conductance boxes
.02		Volt ratio boxes and potential dividers
.03		DC shunts
.04		AC shunts
303	Insulating materials and insulators	
.02		Insulation resistance tests
.06		Direct voltage tests
.07		Alternating voltage tests
307	Voltage standards	
.01		Standard cells
.11		Electronic e.m.f. reference devices
308	Precision transfer instruments	
.01		A.C./D.C. transfer instruments
309	Instrument calibrators	
.01		D.C. voltage
.02		A.C. voltage
.03		DC current
.04		AC current
.51		Resistance

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
310	Indicators and recording instruments	
.01		D.C. voltmeters
.02		A.C. voltmeters
.03		D.C. ammeters
.04		A.C. ammeters
.05		Wattmeters
.06		Varimeters
.07		Phase angle indicators
.08		Power factor meters
.09		Ohmmeters
.10		LCR meters
.11		Galvanometers and null detectors
.21		Electricity meters
.81		Graphic recording instruments
311	Bridges, potentiometers, test sets	
.01		D.C. bridges
.02		D.C. potentiometers
.11		A.C. bridges
.12		A.C. potentiometers
.21		Ratiometers
.31		Current transformer testing sets
.32		Voltage transformer testing sets

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
312	Frequency and time measuring instruments and standards	
.01		Frequency meters
.02		Wavemeters
.11		Counters
.12		Time interval-meters
.13		Clocks and watches
.15		Tachometers
.21		Frequency standards
313	Waveforms measuring instruments	
.01		Frequency characteristics
.02		Input characteristics
.03		Timing characteristics
.04		Distortion
321	Power supplies and stabilizers	
.01		Power supplies
.02		Stabilizers

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)	Instrument
322 Signal sources .01 .02 .03 .04	Frequency characteristics Output characteristics Modulation characteristics Sweep characteristics
325 Communications equipment .01 .02 .03 .04 .05 .06 .07 .08 .09 .12 .13	Line transmission measuring equipment Radio transmission measuring equipment Field intensity measuring equipment Electrical noise and interference measuring equipment Impedance and reflection measuring equipment Spectrum analysis measuring equipment Data transmission equipment Power measuring equipment Attenuators and amplifiers Communications systems Data acquisition systems
340 High voltage testing .11 .12	Direct voltage tests Alternating voltage tests
365 Miscellaneous electrical tests .99	Other tests - calibration of electrical installation testers (Loop impedance, insulation, RCD).

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Electrical Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)	Instrument
501 Calibration of temperature measuring equipment .02 .05 .06 .41	Base metal thermocouples Metallic resistance thermometers Semi-conductor thermometers Digital temperature indicator system

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
501 Calibration of temperature measuring equipment			
.02 Base metal thermocouples	-45°C to +600°C	±0.3 °C to 1.3 °C	Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3027 CTM-3025 CTM-3026
.05 Metallic resistance thermometers	-45°C to +600°C	±0.051°C to 1.2 °C	Measurement of RTD output at specified temperatures and immersion depths CTM-3027
<p>* Notes:</p> <p>1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.</p> <p>2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".</p>			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
501 Calibration of temperature measuring equipment			Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3027
.02 Base metal thermocouples	-80 °C @ CO2 sublimation point	±0.05 °C	
.05 Metallic resistance thermometers	-80 °C @ CO2 sublimation point	±0.05 °C	Measurement of RTD output at specified temperatures and immersion depths
.41 Digital temperature indicator system	-80 °C @ CO2 sublimation point	±0.05 °C	Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3027

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
501 Calibration of temperature measuring equipment			
.41 Digital temperature indicator system	-45 to -10 °C -10 to +50 °C +50 to +100 °C +100 to +120 °C +120 to +140 °C +140 to +200 °C +200 to +300 °C +300 to +400 °C +400 to +500 °C +500 to +600 °C	± 0.066 °C ±0.051 °C ± 0.076 °C ± 0.10 °C ± 0.12 °C ± 0.33 °C ± 0.50 °C ± 0.64 °C ± 0.90 °C ± 1.2 °C	CTM-3027 Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3027
503 Calibration of ancillary temperature measuring instruments	See also electrical classification (3xx)		
.01 Portable potentiometers	-200 °C to +1750 °C	±0.14 °C to 0.59 °C	Calibration of indicators using emf injection (for thermocouple types E,J,K,N,R,T)
.02 Digital voltmeters			
.03 Resistance bridges			
.04 Indicators, recorders and controllers	-200 °C to +600 °C	±0.06 °C to 0.12 °C	Calibration of indicators using resistance
<p>* Notes:</p> <p>1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.</p> <p>2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".</p>			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Temperature Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
510 Testing of temperature controlled enclosures			Direct measurement of ovens, furnaces, dry and wet baths with suitable immersion depth
.01 Ovens, furnaces and baths	-95 °C to 600 °C	±.042 °C to 0.65 °C	(>100mm).
.02 Incubators	0 °C to +70 °C	±0.1 °C	CTM-3004
.03 Autoclaves and sterilising ovens (excluding autoclaves)	+100 °C to +140 °C	±0.5 °C	
.04 Industrial freezers	-95 °C to +10 °C	±0.1 °C	CTM-3040

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Temperature Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)		Instrument
503	Calibration of ancillary temperature measuring instruments	
.01		Portable potentiometers
.02		Digital voltmeters
.03		Resistance bridges
.04		Indicators, recorders and controllers
510	Testing of temperature controlled enclosures	
.01		Ovens, furnaces and baths
.02		Incubators
.03		Autoclaves and sterilising ovens
.04		Industrial freezers

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Pressure Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
141 Pressure and vacuum measuring devices - Generation by Pressure Calibrators:- - Generation by Deadweight Tester:-	Gauge pressure 0 to 1000 Pa 1000 Pa to 200 kPa 200 kPa to 2 MPa	± 1.6 Pa ± 0.025% + 120 Pa ± 0.024% + 590 Pa	CTM-6015/6016/6012
	Negative gauge pressure (vacuum) 0 to -1000 Pa	± 1.6 Pa	CTM-6012 CTM-6015 CTM-6016
	Hydraulic pressure 0 to 350 kPa 350 kPa to 58.6 MPa	± 730 Pa ± 0.12%	CTM-6030
	Gauge pressure - 90 kPa to - 9 kPa 9 kPa to 2.5 MPa	± 0.018% ± 0.018%	CTM-6001 / 6002

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Pressure Calibration Laboratory

(Nominal temperature for calibration work: 23±5 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
141 Pressure and vacuum measuring devices - Generation by Deadweight Tester:-	Negative gauge pressure (vacuum) -4 kPa to -100 kPa	$\pm 0.018\%$	CTM-6002
<p>* Notes:</p> <p>1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.</p> <p>2. Calibration & measurement capability expressed as an uncertainty (\pm) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".</p>			

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Pressure Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)	Instrument
<p>141 Pressure and vacuum measuring devices</p> <p>.01</p> <p>.02</p> <p>.11</p> <p>.12</p> <p>.23</p>	<p>Pressure gauges</p> <p>Vacuum gauges</p> <p>Pressure transducers</p> <p>Pressure recorders</p> <p>Digital manometers</p>

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Torque Calibration Laboratory

(Nominal temperature for calibration work: 23±2 °C)

INAB Classification number (P9) Measured quantity	Range of measurement	Calibration & Measurement Capability expressed as an uncertainty *	Method and remarks
152 Torque measuring devices			
.01 Torque wrenches (incl. screwdrivers)	0.5 N·m to 5 N·m	± 1.6%	CTM-4005 / CTM-4006
	5 N·m to 1000 N·m	± 1.6%	CTM-4005 / CTM-4006

*** Notes:**

1. In accordance with INAB policy, uncertainties are calculated for an estimated confidence level of not less than 95%.
2. Calibration & measurement capability expressed as an uncertainty (±) to be reported in compliance with EA-4/02, "Expression of the Uncertainty of Measurement in Calibration".

Scope of Accreditation



Butler Technologies

Permanent Laboratory:
Category B

Torque Calibration Laboratory

The following types of instrument can be calibrated in accordance with the scheduled measured quantities and ranges. An uncertainty reported on an INAB certificate will be that for the instrument itself during calibration plus the appropriate measurement capability of the laboratory for the quantities and ranges concerned.

INAB Classification number (P9)	Instrument
152 Torque measuring devices .01	Torque wrenches (incl. screwdrivers)