Irish National Accreditation Board

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: **14:11:2017**

Expiry date of this certificate of accreditation: **14:11:2022**

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: Adrienne Duff — Dr Adrienne Duff

Chairperson: Ita Kinahan — Ms Ita Kinahan

Issued on 14 November 2017

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.

The Metropolitan Building, James Joyce Street, Dublin 1, Ireland Tel 1890 289 389 E-mail inab@inab.ie Web inab@inab.ie

Schedule of Accreditation

(Annex to Accreditation Certificate)

Permanent Laboratory:

Category ***A, B***

BUTLER TECHNOLOGIES

Electrical /Temperature / Pressure Calibration Laboratory

Initial Accreditation Date :	**12 March 2010 (Electrical)**
	12-March-2010 (Temperature)
	12-March-2010 (Pressure)
Postal Address:	Unit 14, Block G, Maynooth Business Campus, Co.Kildare, Ireland
Telephone:	+353 (1) 6016260
Fax:	+353 (1) 6016265
E-mail:	david.urquhart@transtest.ie
Contact Name:	David Urquhart
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

(a) portable test equipment
(b) a site laboratory
(c) a mobile laboratory or
(d) 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

ISO 17025 INAB ACCREDITED CALIBRATION DETAILED IN SCOPE REG NO.256C

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 Voltage			Measure & Generate
Up to 200 m V		± 3.5 µV	
0.2 V to 2 V		± 3.5 µV to 15 µV	CTM-101-103,115,116
2 V to 20V		±15 µV to 120 µV	
20 V to 200 V		±150µV to 190µV	('CTM' = Butler Transtest
200 V to 1000 V		±2.2 m V to 9.7 m V	in-house 'Common Test
1 k V to 6 k V		±2.5 V to 15 V	Method')
AC Voltage			Measure & Generate
20 m V to 200 m V	100Hz to 2kHz	±4.8 µV to 28 µV	
20 m V to 200 m V	40 Hz to 10 kHz	±7µV to 30 µV	CTM-101-103, 115,116
20 m V to 200 m V	10 kHz to 30 kHz	±80 µV to 160 µV	
20 m V to 200 m V	30 kHz to 100 kHz	±40 µV to 200 µV	
200 m V to 2 V	100 Hz to 2 kHz	±38 µV to 180 µV	
200 m V to 2 V	40 Hz to 10 kHz	±42 µV to 220 µV	
200 m V to 2 V	10 kHz to 30 kHz	±92 µV to 520 µV	
200 m V to 2 V	30 kHz to 100 kHz	±360 µV to 1.5 m V	
2 V to 20V	100 Hz to 2 kHz	±0.4 m V to 2.2 m V	
2 V to 20V	40 Hz to 10 kHz	±0.42 m V to 2.4m V	
2 V to 20V	10 kHz to 30 kHz	±0.94 m V to 5.2m V	
2 V to 20V	30 kHz to 100 kHz	±3.4 m V to 14 m V	

*** 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
AC Voltage			Measure to 6kV
20 V to 200 V	100 Hz to 2 kHz	± 4 mV to 24 mV	Generate to 3kV
20 V to 200 V	40 Hz to 10 kHz	± 4.4 mV to 26 mV	
20 V to 200 V	10 kHz to 30 kHz	± 4.9 mV to 54 mV	
20 V to 200 V	30 kHz to 100 kHz	± 34 mV to 150 mV	
200 V to 1000 V	100 Hz to 2 kHz	± 34 mV to 130 mV	
200 V to 1000 V	40 Hz to 10 kHz	± 34 mV to 130 mV	
200 V to 1000 V	10 kHz to 30 kHz	± 72 mV to 270 mV	
1 k V to 6 k V	50 Hz	± 4 V to 24V	
Resistance			
Up to 2Ω		± 20 µΩ to 56 µΩ	Measure & Generate
2Ω to 20Ω		± 54 µΩ to 340 µΩ	
20Ω to 200Ω		± 300 µΩ to 2.2 mΩ	CTM-111, 112
200Ω to 2 kΩ		± 2.6 mΩ to 18 mΩ	
2 kΩ to 20 kΩ		± 25 mΩ to 180 mΩ	
20 kΩ to 200 kΩ		± 250 mΩ to 1.8 Ω	
200 kΩ to 2MΩ		± 4.7Ω to 32 Ω	
2 MΩ to 20 MΩ		± 1kΩ to 17 kΩ	
20 MΩ to 200 MΩ		± 120 kΩ to 180 kΩ	
200 MΩ to 1 GΩ		± 12 MΩ to 14 MΩ	
1 GΩ		± 20 MΩ	Generate
10 GΩ		± 200 MΩ	
100 GΩ		± 2.5 GΩ	CTM-112H
1 TΩ		± 30 GΩ	

*** 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
DC Current			Measure & Generate
20 µA to 200 µA		± 1.3 nA to 10 nA	
200 µA to 2 mA		± 11 nA to 75 nA	CTM-105,107,108
2 mA to 20 mA		± 110 nA to 750 nA	
20 mA to 200 mA		± 2.4 µA to 13 µA	
200 mA to 2 A		± 58 µA to 480 µA	Generate to 10A
2 A to 100 A		± 1 mA to 50 mA	
AC Current			
20 µA to 200 µA	10 Hz to 5 kHz	±28 nA to 80 nA	Measure & Generate
200 µA to 2 mA	10 Hz to 5 kHz	±280 nA to 800 nA	
2 mA to 20 mA	10 Hz to 5 kHz	±2.8 µA to 8 µA	CTM-105,107,108
20 mA to 200 mA	10 Hz to 5 kHz	±28 µA to 88 µA	
200 mA to 2 A	10 Hz to 1 kHz	±0.6 mA to 2 mA	
2 A to 100 A	40 Hz to 400 Hz	±7 mA to 350 mA	Generate to 50A
Phase			For waveforms > 200 mV
0 to ±360°	40 Hz to 100 kHz	±0.95°	CTM-161

*** 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

Permanent Laboratory:

Category A

Butler Technologies

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			By rss addition of
0 to -40 dB	100 Hz to 100 kHz	±0.7 dB	harmonics
-40 to -60 dB	100 Hz to 100 kHz	±0.8 dB	
-60 to -80 dB	100 Hz to 100 kHz	±2.4 dB	CTM-154
-80 to -90 dB	100 Hz to 100 kHz	±5 dB	
Frequency			
0.03 Hz to 3 kHz		±0.45mHz to 4.5mHz	CTM-114/301/302/303
3 kHz to 30 kHz		±0.48mHz to 4.8mHz	310/311
30 kHz to 300 kHz		±0.45mHz to 51mHz	
300 kHz to 30 MHz		±0.6 mHz to 60 mHz	
30 MHz to 1.3 GHz		±42 mHz to 1.8 Hz	
1.3 MHz to 18 GHz		±1.8 Hz to 25 Hz	
Time			
1 us up		±33 ns	CTM-163
RF Power			
0 dBm / 1 mW	At 50 MHz	± 1.0% or 0.043 dB	Measure Into 50 Ohms
			CTM-1010,1011,1012
-70 dBm to -60 dBm	10 MHz to 4 GHz	± 0.68 dB to 0.58 dB	Type 'N' (f) connectors
-60 dBm to -50 dBm	10 MHz to 4 GHz	± 0.50 dB to 0.17 dB	Other connectors will
-50 dBm to -40 dBm	10 MHz to 4 GHz	± 0.23 dB to 0.13 dB	increase uncertainty
-40 dBm to -20 dBm	10 MHz to 4 GHz	± 0.16 dB to 0.13 dB	

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

*** 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
RF Attenuation			
1 dB to 49 dB	1 kHz to 1 GHz	±0.32 dB	50 Ohm system
50 dB to 79 dB	1 kHz to 1 GHz	±0.45 dB	Instrument input
80 dB to 90 dB	1 kHz to 1 GHz	±0.9 dB	attenuators
90 dB to 95 dB	1 kHz to 1 GHz	±1.4 dB	
95 dB to 100 dB	1 kHz to 1 GHz	±2.6 dB	CTM-1006
1 dB to 49 dB	1 kHz to 1 GHz	±0.42 dB	
50 dB to 79 dB	1 kHz to 1 GHz	±0.48 dB	50 Ohm system
80 dB to 90 dB	1 kHz to 1 GHz	±1.3 dB	Instrument output
90 dB to 95 dB	1 kHz to 1 GHz	±1.9 dB	attenuators
95 dB to 100 dB	1 kHz to 1 GHz	±2.7 dB	
			CTM-1007,1008
VRC			
0.7 to 0.18	300 kHz to 1 GHz	±0.016	Type 'N' (f)
0.18 to 0.013	300 kHz to 1 GHz	±0.012	Other connectors will
0.7 to 0.18	1 GHz to 3 GHz	±0.018	increase uncertainty
0.18 to 0.013	1 GHz to 3 GHz	±0.014	
			CTM-1053/1054
Amplitude Modulation			For low distortion
5% to 95%	10 MHz to 2.4 GHz fcar.		modulation waveforms
	300 Hz to 20 kHz fmod.	±0.1%	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

*** 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
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:**

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
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 2000mA	±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:**

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 ºC to +600 ºC	±0.3 ºC to 1.3 ºC	
.05	Metallic resistance thermometers	-95 ºC to +600 ºC	±0.051 ºC to 0.1 ºC	Measurement of RTD output at specified temperatures and immersion depths
		Water Triple Point (0.01 ºC)	± 0.005 ºC	
		Gallium Melt Point (29.7646 ºC)	± 0.005 ºC	
.41	Digital temperature indicator system	-95 ºC - -40 ºC	± 0.1 ºC	Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3027
		-40 to -20 ºC	± 0.066 ºC	
		-20 to +150 ºC	± 0.019 ºC	
		+150 to +200 ºC	± 0.05 ºC	
		+200 to +300 ºC	± 0.1 ºC	
		+300 to +400 ºC	± 0.1 ºC	
		+400 to +500 ºC	± 0.1 ºC	
		+500 to +600 ºC	± 0.1 ºC	

*** 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

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:**

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

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 *Lab-inserted text*			
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. CTM-3004
.01	Ovens, furnaces & baths	-95 °C to 600 °C	±.042 °C to 0.65 °C	
.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:**

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

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	Gauge pressure		
Pressure Calibrators:-	0 to 1000 Pa	± 1.4 Pa	CTM-6015 /6016/6012
	1000 Pa to 200 kPa	± 0.025% + 120 Pa	
	200 kPa to 2 MPa	± 0.024% + 590 Pa	
	Negative gauge pressure (vacuum) 0 to -1000 Pa	± 1.4 Pa	CTM-6012, 6015 /6016
	Hydraulic pressure		
	0 To 350 kPa	± 730 Pa	CTM-6030
	350 kPa to 58.6 MPa	± 0.12% Pa	

*** 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	± 0.0048%	
	2.5 MPa to 12 MPa	± 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

Permanent Laboratory:

Category B

Butler Technologies

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		± 3.5 µV	Measure & Generate
0.2 V to 2 V		± 3.5 µV to 15 µV	
2 V to 20 V		± 15 µV to 120 µV	CTM-103
20 V to 200 V		± 150 µV to 190 µV	
200 V to 1000 V		± 2.2 mV to 9.7 mV	
1 kV to 6 kV		± 2.5 V to 15 V	
AC Voltage			
20 mV to 200 mV	100 Hz to 2 kHz	± 4.8 µV to 28 µV	Measure & Generate
20 mV to 200 mV	40 Hz to 10 kHz	± 7 µV to 30 µV	
20 mV to 200 mV	10 kHz to 30 kHz	± 80 µV to 160 µV	CTM-103
20 mV to 200 mV	30 kHz to 100 kHz	± 40 µV to 200 µV	
200 mV to 2 V	100 Hz to 2 kHz	± 38 µV to 180 µV	
200 mV to 2 V	40 Hz to 10 kHz	± 42 µV to 220 µV	
200 mV to 2 V	10 kHz to 30 kHz	± 92 µV to 520 µV	
200 mV to 2 V	30 kHz to 100 kHz	± 360 µV to 1.5 mV	
2 V to 20 V	100 Hz to 2 kHz	± 0.4 mV to 2.2 mV	
2 V to 20 V	40 Hz to 10 kHz	± 0.42 mV to 2.4 mV	
2 V to 20 V	10 kHz to 30 kHz	± 0.94 mV to 5.2 mV	
2 V to 20 V	30 kHz to 100 kHz	± 3.4 mV to 14 mV	

*** 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	100 Hz to 2 kHz	± 4 mV to 24 mV	Measure to 6kV
20 V to 200 V	40 Hz to 10 kHz	± 4.4 mV to 26 mV	Generate to 3kV
20 V to 200 V	10 kHz to 30 kHz	± 4.9 mV to 54 mV	
20 V to 200 V	30 kHz to 100 kHz	± 34 mV to 150 mV	
200 V to 1000 V	100 Hz to 2 kHz	± 34 mV to 130 mV	
200 V to 1000 V	40 Hz to 10 kHz	± 34 mV to 130 mV	('CTM' = Butler Transtest
200 V to 1000 V	10 kHz to 30 kHz	± 72 mV to 270 mV	in-house
1 kV to 6 kV	50 Hz	± 4 V to 24V	'Common Test Method')
Resistance			
Up to 2Ω		± 20 μΩ to 56 μΩ	Measure & Generate
2Ω to 20Ω		± 54 μΩ to 340 μΩ	
20Ω to 200Ω		± 300 μΩ to 2.2 mΩ	CTM-112
200Ω to 2 kΩ		± 2.6 mΩ to 18 mΩ	
2 kΩ to 20 kΩ		± 25 mΩ to 180 mΩ	
20 kΩ to 200 kΩ		± 250 mΩ to 1.8 Ω	
200 kΩ to 2 MΩ		± 4.7Ω to 32 Ω	
2 MΩ to 20 MΩ		± 1kΩ to 17 kΩ	
20 MΩ to 200 MΩ		± 120 kΩ to 180 kΩ	
200 MΩ to 1 GΩ		± 12 MΩ to 14 MΩ	

*** 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		± 20 MΩ	Generate
10 GΩ		± 200 MΩ	
100 GΩ		± 2.5 GΩ	CTM-112
1 TΩ		± 30 GΩ	
DC Current			
20 µA to 200 µA		± 1.3 nA to 10 nA	Measure & Generate
200 µA to 2 mA		± 11 nA to 75 nA	
2 mA to 20 mA		± 110 nA to 750 nA	CTM-107/108
20 mA to 200 mA		± 2.4 µA to 13 µA	
200 mA to 2 A		± 58 µA to 480 µA	
2 A to 100 A		± 1 mA to 50 mA	Generate to 10A
AC Current			
20 µA to 200 µA	10 Hz to 5 kHz	±28 nA to 80 nA	Measure & Generate
200 µA to 2 mA	10 Hz to 5 kHz	±280 nA to 800 nA	
2 mA to 20 mA	10 Hz to 5 kHz	±2.8 µA to 8 µA	CTM-107/108
20 mA to 200 mA	10 Hz to 5 kHz	±28 µA to 88 µA	
200 mA to 2 A	10 Hz to 1 kHz	±0.6 mA to 2 mA	
2 A to 100 A	40 Hz to 400 Hz	±7 mA to 350 mA	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 measuremen	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	100 Hz to 100 kHz	±0.7 dB	By rss addition of harmonics
-40 to -60 dB	100 Hz to 100 kHz	±0.8 dB	
-60 to -80 dB	100 Hz to 100 kHz	±2.4 dB	CTM-154
-80 to -90 dB	100 Hz to 100 kHz	±5 dB	
Frequency			
0.03 Hz to 3 kHz		±0.45 mHz to 4.5 mHz	CTM-114/301/302/310/31
3 kHz to 30 kHz		±0.48 mHz to 4.8 mHz	
30 kHz to 300 kHz		±0.45 mHz to 51 mHz	
300 kHz to 30 MHz		±0.6 mHz to 60 mHz	
30 MHz to 1.3 GHz		±42 mHz to 1.8 Hz	
1.3 MHz to 18 GHz		±1.8 Hz to 25 Hz	
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	At 50 MHz	± 1.0% or 0.043 dB	Measure Into 50 Ohms
-70 dBm to -60 dBm	10 MHz to 4 GHz	± 0.68 dB to 0.58 dB	Type 'N' (f) connectors
-60 dBm to -50 dBm	10 MHz to 4 GHz	± 0.50 dB to 0.17 dB	Other connectors will
-50 dBm to -40 dBm	10 MHz to 4 GHz	± 0.23 dB to 0.13 dB	increase uncertainty
-40 dBm to -20 dBm	10 MHz to 4 GHz	± 0.16 dB to 0.13 dB	
			CTM-1010
RF Power Level			
0 dBm to -30 dBm	2.5 MHz to 1.3 GHz	±0.11 dB	50 Ohm system
-30 dBm to -40dBm	2.5 MHz to 1.3 GHz	±0.12 dB	Type N connectors
-40 dBm to -50 dBm	2.5 MHz to 1.3 GHz	±0.15 dB	Other connectors will
-50 dBm to -60 dBm	2.5 MHz to 1.3 GHz	±0.16 dB	increase uncertainty
-60 dBm to -70 dBm	2.5 MHz to 1.3 GHz	±0.18 dB	Appropriate to the
-70 dBm to -80 dBm	2.5 MHz to 1.3 GHz	±0.20 dB	calibration of sources and
-80 dBm to -90 dBm	2.5 MHz to 1.3 GHz	±0.24 dB	receivers
-90 dBm to -100 dBm	2.5 MHz to 1.3 GHz	±0.26 dB	
-100 dBm to -110 dBm	2.5 MHz to 1.3 GHz	±0.28 dB	
-110 dBm to -127 dBm	2.5 MHz to 1.3 GHz	±0.34 dB	

*** 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	10 MHz to 30 MHz	±3.4% or 0.15 dB	Generate
-20 dBm to +10 dBm	30 MHz to 1 GHz	±2.6% or 0.11 dB	
-20 dBm to +10 dBm	30 MHz to 3 GHz	±3% or 0.13 dB	
-30 dBm to +10 dBm	200 kHz to 500 kHz	±3.5% or 0.15 dB	
-30 dBm to +10 dBm	500 kHz to 50 MHz	±3.3% or 0.14 dB	
RF Attenuation			
1 dB to 49 dB	1 kHz to 1 GHz	±0.32 dB	50 Ohm system
50 dB to 79 dB	1 kHz to 1 GHz	±0.45 dB	Instrument input
80 dB to 90 dB	1 kHz to 1 GHz	±0.9 dB	attenuators
90 dB to 95 dB	1 kHz to 1 GHz	±1.4 dB	
95 dB to 100 dB	1 kHz to 1 GHz	±2.6 dB	CTM-1006
1 dB to 49 dB	1 kHz to 1 GHz	±0.42 dB	
50 dB to 79 dB	1 kHz to 1 GHz	±0.48 dB	50 Ohm system
80 dB to 90 dB	1 kHz to 1 GHz	±1.3 dB	Instrument output
90 dB to 95 dB	1 kHz to 1 GHz	±1.9 dB	attenuators
95 dB to 100 dB	1 kHz to 1 GHz	±2.7 dB	
			CTM-1007

*** 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
VRC			
0.7 to 0.032	100 kHz to 300 kHz	±0.034	50 Ohm system BNC (f)
0.7 to 0.18	300 kHz to 1 GHz	±0.016	Type 'N' (f)
0.18 to 0.0	300 kHz to 1 GHz	±0.012	Other connectors will
0.7 to 0.18	1 GHz to 3 GHz	±0.018	increase uncertainty
0.18 to 0.0	1 GHz to 3 GHz	±0.014	
			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	±0.63 MHz to 1.6MHz	Measurement in 50 Ohm system Oscilloscope bandwidth calculated using 0.35 = tr/bw assuming the oscilloscope input to be Gaussian
	250 to 350 MHz	±1.6 MHz to 2.2 MHz	
	350 to 450 MHz	±2.2 MHz to 3 MHz	
	450 to 550 MHz	±3 MHz to 3.7 MHz	
	550 to 650 MHz	±3.7 MHz to 5 MHz	
	650 to 740 MHz	±5 MHz to 6.5 MHz	
	750 to 1 GHz	±6.5 MHz to 100 MHz	

*** 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:**

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

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		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 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		Base metal thermocouples
.05		Metallic resistance thermometers
.06		Semi-conductor thermometers
.41		Digital temperature indicator system

Scope of Accreditation

ISO 17025 INAB ACCREDITED CALIBRATION DETAILED IN SCOPE REG NO.256C

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

*** 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

ISO 17025 INAB ACCREDITED CALIBRATION DETAILED IN SCOPE REG NO.256C

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

ISO 17025 INAB ACCREDITED CALIBRATION
DETAILED IN SCOPE REG NO.256C

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)		Calibration of indicators using emf injection (for thermocouple types E,J,K,N,R,T)
.01	Portable potentiometers	-200 °C to +1750 °C	±0.14 °C to 0.59 °C	
.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

*** 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
510	**Testing of temperature controlled enclosures**			Direct measurement of ovens, furnaces, dry and wet baths with suitable immersion depth (>100mm). CTM-3004
.01	Ovens, furnaces and baths	-95 °C to 600 °C	±.042 °C to 0.65 °C	
.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	-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

Permanent Laboratory:

Category B

Butler Technologies

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:-	Gauge pressure		
	0 to 1000 Pa	± 1.6 Pa	CTM-6015/6016/6012
	1000 Pa to 200 kPa	± 0.025% + 120 Pa	
	200 kPa to 2 MPa	± 0.024% + 590 Pa	
	Negative gauge pressure (vacuum)		
	0 to -1000 Pa	± 1.6 Pa	CTM-6012 CTM-6015 CTM-6016
	Hydraulic pressure		
	0 to 350 kPa	± 730 Pa	
	350 kPa to 58.6 MPa	± 0.12%	CTM-6030
- Generation by Deadweight Tester:-	Gauge pressure		
	- 90 kPa to - 9 kPa	± 0.018%	
	9 kPa to 2.5 MPa	± 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

Permanent Laboratory:

Category B

Butler Technologies

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	± 0.018%	CTM-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

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
141	**Pressure and vacuum measuring devices**	
.01		Pressure gauges
.02		Vacuum gauges
.11		Pressure transducers
.12		Pressure recorders
.23		Digital manometers