

# Schedule of Accreditation



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Trading As	Butler Technologies
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Accreditation Standard	ISO 17025 C
Date Initially Awarded	12/03/2010
Scope Classification	Metrology

Services available to the public<sup>1</sup>

<sup>1</sup> Refer to document on interpreting INAB Scopes of Accreditation

Sites from which accredited services are delivered		
(the detail of the accredited services delivered at each site are on the Scope of Accreditation)		
	Name	Address
1	Business Office	G14, Maynooth Business Campus, Maynooth, Kildare, W23 X8R9



# Scope of Accreditation

## Business Office

### Metrology

Category: A

Metrology field - Calibrated Device Type	Measured quantity	Calibration range	Calibration and measurement capability (CMC)	Std. ref/SOP	Products	Remarks
106 Pressure - .01 Aneroid barometers	Pressure	50kPa to 110kPa	±23Pa	CTM-6005		
106 Pressure - .02 Barographs			±23Pa	CTM-6005		
106 Pressure - .04 Gauge barometers			±23Pa	CTM-6006		
106 Pressure - .06 Pressure gauges		0 to 58.6Mpa	±730Pa to ±0.07MPa	CTM-6030		Hydraulic Pressure
		0Pa to 12MPa	±0.0048% to ±(0.01%+500Pa)	CTM-6003, CTM-6012, CTM-6015, CTM-6016, CTM-6019		
106 Pressure - .07 Vacuum gauges		-3.5kPa to -90kPa	±(0.0098%+0.9Pa)	CTM-6004		
106 Pressure - .10 Pressure recorders		0Pa to 12MPa	±0.0048% to ±(0.01%+500Pa)	CTM-6003, CTM-6012, CTM-6015, CTM-6016, CTM-6019		
				CTM-6003, CTM-6012, CTM-6015, CTM-6016, CTM-6019		
				CTM-6003, CTM-6012, CTM-6015, CTM-6016, CTM-6019		
106 Pressure - .13 Digital manometers			±0.0048% to ±(0.01%+500Pa)	CTM-6003, CTM-6012, CTM-6015, CTM-6016, CTM-6019		
106 Pressure - .99 Other			±0.0048% to ±(0.01%+500Pa)	CTM-6003, CTM-6012, CTM-6015, CTM-6016, CTM-6019		
107 Temperature measuring equipment - .02 Base metal thermocouples	Temperature	-80 °C @ CO2 sublimation point	±0.05 °C	Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3052		
		-95°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		

107 Temperature measuring equipment - .03 Metallic resistance thermometers		-80 °C @ CO2 sublimation point	±0.05 °C	Measurement of RTD output at specified temperatures and immersion depths CTM-3052		
		-95°C to 600°C Water Triple Point (0.01 °C) Gallium Melt Point (29.7646 °C)	±0.051°C to ±0.1°C ± 0.005 °C ± 0.005 °C	Measurement of RTD output at specified temperatures and immersion depths CTM-3027		
107 Temperature measuring equipment - .04 Semiconductor thermometers		-95 to -40 °C -40 to -20 °C -20 to +150 °C +150 to +200 °C +200 to +300 °C +300 to +400 °C +400 to +500 °C +500 to +600 °C	± 0.1 °C ± 0.066 °C ± 0.019 °C ± 0.05 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C	CTM-3027		
107 Temperature measuring equipment - .09 Digital temperature indicator systems		-80 °C @ CO2 sublimation point	±0.05 °C	Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3052		
		95 °C to -40 °C -40 to -20 °C -20 to +150 °C +150 to +200 °C +200 to +300 °C +300 to +400 °C +400 to +500 °C +500 to +600 °C	± 0.1 °C ± 0.066 °C ± 0.019 °C ± 0.05 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C	CTM-3027		
107 Temperature measuring equipment - .11 Electronic	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
108 Temperature controlled enclosures - .01 Ovens, furnaces, baths	Temperature	-95°C to 600°C	±0.042°C to ±0.65°C	CTM-3004		
108 Temperature controlled enclosures - .02 Incubators		0°C to 70°C	±0.1°C	CTM-3005		
108 Temperature controlled enclosures - .03 Autoclaves and sterilising ovens		100°C to 140°C	±0.5°C	CTM-3004		
108 Temperature controlled enclosures - .04 Industrial freezers		-95°C to 10°C	±0.05°C	CTM-3040		
109 Ancillary temperature measuring instruments - .01 Portable potentiometers		-200°C to 1750°C	±0.06°C to ±0.59°C	CTM-3027		
109 Ancillary temperature measuring instruments - .02 Digital voltmeters			±0.06°C to ±0.59°C	CTM-3027		
109 Ancillary temperature measuring instruments -			±0.06°C to ±0.59°C	CTM-3027		

.03 Resistance bridges						
109 Ancillary temperature measuring instruments - .04 Indicators, recorders and controllers			±0.06°C to ±0.59°C	CTM-3027		
110 Electrical - .01 Indicating and recording instruments	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		
	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 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	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 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	±4.8 µV to 28 µV ±7µV 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 m V ±0.4 m V to 2.2 m V ±0.42 m V to 2.4m V ±0.94 m V to 5.2m V ±3.4 m V to 14 m V ± 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 & Generate CTM-101,103, 115,116		
	Amplitude Modulation	10 MHz to 2.4 GHz fcar. 300 Hz to 20 kHz fmod.	±0.4%	CTM-1025		
	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		
	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- 101,103,115,116 ( 'CTM' = Butler Technologies in- house 'Common Test Method ' )		
	Frequency Modulation 250Hz to 250kHz	10 MHz to 2.4 GHz fcar. 300 Hz to 20 kHz fmod.	±0.3Hz to ±300Hz	For low distortion modulation waveforms  CTM-1030, CTM-1031		
	Frequency .03 Hz to 3 kHz		±0.45mHz to	CTM-114, CTM-301, CTM-302, CTM-303,		

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		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-310, CTM-311		
Horizontal Deflection 1S to 1nS		±3mS to ±30pS	CTM-206, CTM-207		
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		
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 ±0.015 to 0.034 Ω ±0.034 to 0.063 Ω ±0.063 to 0.590 Ω ±0.59 to 5.80 Ω	As per Calibrator Manual		
Oscilloscopes Risetime/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  CTM-217, CTM-218		
Phase	0 to 360°	±0.95°	For waveforms > 200 mV  CTM-161		
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	As per Calibrator Manual		
RCD Trip Time (@ 50 Hz)	20ms to 1000mS	±1.2mS	As per Calibrator Manual		
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		± 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 ± 4.7 Ω to 32 Ω ± 1 kΩ to 17 kΩ ± 120 kΩ to 180 kΩ ± 12 MΩ to 14 MΩ	Measure and Generate  CTM-111, CTM-112, CTM-112H		

1 GΩ 10 GΩ 100 GΩ 1 TΩ		± 20 MΩ ± 200 MΩ ± 2.5 GΩ ± 30 GΩ			
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 output attenuators  CTM-1006, CTM- 1007, CTM-1008		
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	±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 0 dBm / 1 mW  -70 dBm to -60 dBm -60 dBm to -50 dBm -50 dBm to -40 dBm -40 dBm to -20 dBm -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	At 50 MHz  10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz 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	± 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 ±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	Measure Into 50 Ohms CTM-1010,1011,1012 Type 'N' (f) connectors Other connectors will increase uncertainty		

	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, CTM-214, CTM-1064		
	Time 1µS up		±33nS	CTM-163		
	Vertical Deflection 100µV to 100V		±5.4µV to ±400mV	CTM-202, CTM-203		
	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, CTM-1054		
110 Electrical - .02 Inductors and transformers	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
110 Electrical - .04 Resistors	Resistance 0 to 1 TΩ		±20µΩ to ±30GΩ	CTM-111, CTM-112, CTM-112H		
110 Electrical - .05 Conductors	Resistance 0 to 1TΩ		±20µΩ to ±30GΩ	CTM-111, CTM-112, CTM-112H		
110 Electrical - .06 Potentiometers	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
110 Electrical - .07 Transducers			See 110.01 for CMC	See 110.01 for SOP		
110 Electrical - .99 Other			See 110.01 for CMC	See 110.01 for SOP		
111 Frequency - .01 Frequency meters	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, CTM-301, CTM-302, CTM-303, CTM-310, CTM-311		
111 Frequency - .02 Wavemeters	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
111 Frequency - .03 Counters			See 110.01 for CMC	See 110.01 for SOP		
111 Frequency - .99 Other			See 110.01 for CMC	See 110.01 for SOP		
112 Speed - .01 Centrifuges			See 110.01 for CMC	See 110.01 for SOP		
112 Speed - .02 Tachometers			See 110.01 for CMC	See 110.01 for SOP		



112 Speed - .03 Speedometers			See 110.01 for CMC	See 110.01 for SOP		
113 Time - .01 Oscilloscopes			See 110.01 for CMC	See 110.01 for SOP		
113 Time - .02 Clocks and stopwatches			See 110.01 for CMC	See 110.01 for SOP		
113 Time - .03 Tachometers			See 110.01 for CMC	See 110.01 for SOP		
113 Time - .99 Other			See 110.01 for CMC	See 110.01 for SOP		

Metrology

Category: B

Metrology field - Calibrated Device Type	Measured quantity	Calibration range	Calibration and measurement capability (CMC)	Std. ref/SOP	Products	Remarks
106 Pressure - .06 Pressure gauges	Pressure	0 to 58.6Mpa	$\pm 730\text{Pa}$ to $\pm 0.07\text{MPa}$	CTM-6030		
		0Pa to 2.5MPa	$\pm 0.018\%$ to $\pm (0.01\% + 500\text{Pa})$	CTM-6001, CTM-6002, CTM-6012, CTM-6015, CTM-6016		
		-4kPa to -100kPa	$\pm 0.018\%$	CTM-6002		
		0Pa to 2.5MPa	$\pm 0.018\%$ to $\pm (0.01\% + 500\text{Pa})$	CTM-6001, CTM-6002, CTM-6012, CTM-6015, CTM-6016		Hydraulic Pressure
			$\pm 0.018\%$ to $\pm (0.01\% + 500\text{Pa})$	CTM-6001, CTM-6002, CTM-6012, CTM-6015, CTM-6016		
106 Pressure - .07 Vacuum gauges						
106 Pressure - .10 Pressure recorders						
106 Pressure - .13 Digital manometers						
106 Pressure - .99 Other						
107 Temperature measuring equipment - .02 Base metal thermocouples	Temperature	-45°C to 600°C	$\pm 0.3^\circ\text{C}$ to $\pm 1.3^\circ\text{C}$	Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3027 CTM-3025 CTM-3026		
		-80 °C @ CO2 sublimation point	$\pm 0.05^\circ\text{C}$	Measurement of thermocouple output at specified temperatures and immersion depths (for thermocouple types E, J, K, N, T) CTM-3052		
107 Temperature measuring equipment - .03 Metallic resistance thermometers		-45°C to 600°C	$\pm 0.051^\circ\text{C}$ to $\pm 1.2^\circ\text{C}$	Measurement of RTD output at specified temperatures and immersion depths CTM-3027		
		-80 °C @ CO2 sublimation point	$\pm 0.05^\circ\text{C}$	Measurement of RTD output at specified temperatures and immersion depths CTM-3052		

107 Temperature measuring equipment - .04 Semiconductor thermometers		-45°C to 600°C	±0.051°C to ±1.2°C	CTM-3027		
107 Temperature measuring equipment - .09 Digital temperature indicator systems		-40 to -20 °C -20 to +150 °C +150 to +200 °C +200 to +300 °C +300 to +400 °C +400 to +500 °C +500 to +600 °C	± 0.051 °C ± 0.066 °C ± 0.05 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C ± 0.1 °C	CTM-3027		
		-80 °C @ CO2 sublimation point	±0.05 °C	Best uncertainty plus resolution of instrument ±¼ smallest graduation ±½ least significant digit CTM-3052		
107 Temperature measuring equipment - .11 Electronic	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
108 Temperature controlled enclosures - .01 Ovens, furnaces, baths	Temperature	-95°C to 600°C	±0.042°C to ±0.65°C	CTM-3004		
108 Temperature controlled enclosures - .02 Incubators		0°C to 70°C	±0.1°C	CTM-3005		
108 Temperature controlled enclosures - .03 Autoclaves and sterilising ovens		100°C to 140°C	±0.5°C	CTM-3004		
108 Temperature controlled enclosures - .04 Industrial freezers		-95°C to 10°C	±0.1°C	CTM-3040		
109 Ancillary temperature measuring instruments - .01 Portable potentiometers		-200°C to 1750°C	±0.06°C to ±0.59°C	CTM-3027		
109 Ancillary temperature measuring instruments - .02 Digital voltmeters				CTM-3027		
109 Ancillary temperature measuring instruments - .03 Resistance bridges				CTM-3027		
109 Ancillary temperature measuring instruments - .04 Indicators, recorders and controllers				CTM-3027		
110 Electrical - .01 Indicating and recording instruments	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 11A		
	AC Voltage 20 mV to 200 mV 20 mV to 200 mV 20 mV to 200 mV 20 mV to 200 mV	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	Measure & Generate  CTM-103		

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 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 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 50 Hz	± 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 ± 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 24 V	('CTM' = Butler Technologies in-house 'Common Test Method')		
Amplitude Modulation 5% to 95%	10 MHz to 2.4 GHz fcar 300 Hz to 20 kHz fmod	±0.3 Hz to 300 Hz	CTM-1021, CTM-1022		
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 11A		
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-101,103,115,116		
Frequency Modulation 250 Hz to 250 kHz fd	10 MHz to 2.4 GHz fcar 300 Hz to 20 kHz fmod	±0.3Hz to ±300Hz	For low distortion modulation waveforms  CTM-1031		
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		
Horizontal Deflection 1S to 1nS		±3mS to ±30pS	CTM-206, CTM-207		
LF Distortion 0 to -40 dB -40 to -60 dB -60 to -80 dB	100 Hz to 100 kHz 100 Hz to 100 kHz 100 Hz to 100 kHz	±0.7 dB ±0.8 dB ±2.4 dB	By rss addition of harmonics		

-80 to -90 dB	100 Hz to 100 kHz	±5 dB	CTM-154		
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 ±0.015 to 0.034 Ω ±0.034 to 0.063 Ω ±0.063 to 0.590 Ω ±0.59 to 5.80 Ω	Generated using dedicated electrical test equipment calibrator (Method per calibrator manual)		
Oscilloscopes Risetime/Bandwidth	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		
Peak to Peak Voltage 0.1V to 10V	1 kHz to 5 MHz	±300uV to ±30mV	CTM-167		
Phase 0 to 360°	40 Hz to 100 Hz	±0.95°	For waveforms > 200 mV  CTM-161		
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 ±0.2 to 0.5 mA ±0.5 to 1.3 mA ±1.3 to 1.5 mA ±1.5 to 1.6 mA ±1.6 to 4.9 mA ±4.9 to 15 mA ±15 to 29 mA	Measured using dedicated electrical test equipment calibrator  (Method per calibrator manual)		
RCD Trip Time (@ 50 Hz)	20ms to 1000mS	±1.2mS	Measured using dedicated electrical test equipment calibrator (Method per calibrator manual)		
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 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 ± 4.7 Ω to 32 Ω ± 1 kΩ to 17 kΩ ± 120 kΩ to 180 kΩ ± 12 MΩ to 14 MΩ ± 20 MΩ ± 200 MΩ ± 2.5 GΩ ± 30 GΩ	Measure and Generate  CTM-112		

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	$\pm 0.32$ dB $\pm 0.45$ dB $\pm 0.9$ dB $\pm 1.4$ dB $\pm 2.6$ dB $\pm 0.42$ dB $\pm 0.48$ dB $\pm 1.3$ dB $\pm 1.9$ dB $\pm 2.7$ dB	50 Ohm system Instrument input attenuators  CTM-1006  50 Ohm system Instrument output attenuators  CTM-1007		
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	$\pm 0.11$ dB $\pm 0.12$ dB $\pm 0.15$ dB $\pm 0.16$ dB $\pm 0.18$ dB $\pm 0.20$ dB $\pm 0.24$ dB $\pm 0.26$ dB $\pm 0.28$ dB $\pm 0.34$ dB	50 Ohm system Type N connectors Other connectors will increase uncertainty Appropriate to the calibration of sources and receivers		
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 -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	At 50 MHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz 10 MHz to 4 GHz 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	$\pm 1.0\%$ or 0.043 dB $\pm 0.68$ dB to 0.58 dB $\pm 0.50$ dB to 0.17 dB $\pm 0.23$ dB to 0.13 dB $\pm 0.16$ dB to 0.13 dB $\pm 3.4\%$ or 0.15 dB $\pm 2.6\%$ or 0.11 dB $\pm 3\%$ or 0.13 dB $\pm 3.5\%$ or 0.15 dB $\pm 3.3\%$ or 0.14 dB	Measure Into 50 Ohms  Type 'N' (f) connectors Other connectors will increase uncertainty  CTM-1010		
RF Voltage 1V $\pm 10\%$	1 kHz to 50 kHz 50 kHz to 500 kHz 500 kHz to 5 MHz 5 MHz to 20 MHz	$\pm 1.2$ mV $\pm 1.3$ mV $\pm 1.5$ mV $\pm 2.8$ mV	Measurement in 50 Ohm system  CTM-166/1201		
Risetime	Down to 25 ps  130 ps	$\pm (6\% + 10\text{ps})$  $\pm 13$ ps	Measurement in 50 Ohm system Repetitive		

				waveform generation in a 50 Ohm system CTM-1061/2/3		
	Time	1µS up	±33nS	CTM-163		
	Vertical Deflection 100µV to 100V		±5.4µV to ±400mV	CTM-202, CTM-203		
	VRC 0.7 to 0.18 0.18 to 0.0 0.7 to 0.18 0.18 to 0.0	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		
110 Electrical - .02 Inductors and transformers	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
110 Electrical - .04 Resistors	Resistance 0 to 1TΩ		±20µΩ to ±30GΩ	CTM-111, CTM-112, CTM-112H		
110 Electrical - .05 Conductors			±20µΩ to ±30GΩ	CTM-111, CTM-112, CTM-112H		
110 Electrical - .06 Potentiometers	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
110 Electrical - .07 Transducers			See 110.01 for CMC	See 110.01 for SOP		
110 Electrical - .99 Other			See 110.01 for CMC	See 110.01 for SOP		
111 Frequency - .01 Frequency meters	Frequency	0.03Hz to 18GHz	±0.45mHz to ±25Hz	CTM-114, CTM-301, CTM-302, CTM-303, CTM-310, CTM-311		
111 Frequency - .02 Wavemeters	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
111 Frequency - .03 Counters			See 110.01 for CMC	See 110.01 for SOP		
111 Frequency - .99 Other			See 110.01 for CMC	See 110.01 for SOP		
112 Speed - .01 Centrifuges			See 110.01 for CMC	See 110.01 for SOP		
112 Speed - .02 Tachometers	See 110.01 for CMC	See 110.01 for SOP				
112 Speed - .03 Speedometers	See 110.01 for CMC	See 110.01 for SOP				
113 Time - .01 Oscilloscopes	See 110.01 for measured quantity	See 110.01 for calibration range	See 110.01 for CMC	See 110.01 for SOP		
113 Time - .02 Clocks and stopwatches			See 110.01 for CMC	See 110.01 for SOP		
113 Time - .03 Tachometers			See 110.01 for CMC	See 110.01 for SOP		
113 Time - .99 Other			See 110.01 for CMC	See 110.01 for SOP		