

Schedule

Tektronix Southeast Asia Pte Ltd
Service and Calibration Centre
1 Clementi Loop
#06-02/03/04
Singapore 129808

Certificate No. : LA-1997-0124-C
Issue No. : 22
Date : 06 January 2021
Page : 1 of 10

FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
A. Electrical – DC/LF		
A1. DC Voltage Measuring Instrument	WI-SG-0011	
0 mV to 220 mV		8 ppm + 0.6 μ V
220 mV to 2.2 V		7 ppm + 1.1 μ V
2.2 V to 11 V		6.9 ppm + 4.4 μ V
11 V to 22 V		7 ppm + 5 μ V
22 V to 220 V		8 ppm + 85 μ V
220 V to 1100 V		9 ppm + 560 μ V
A2. Resistance Measuring Instrument	WI-SG-0011	
1 Ω		6.4 ppm
10 Ω		6.3 ppm
100 Ω		5.1 ppm
1 k Ω		4.8 ppm
10 k Ω		3.3 ppm
100 k Ω		4.8 ppm
1 M Ω		9.4 ppm
10 M Ω		10 ppm
100 M Ω		52 ppm
1 G Ω		55 ppm
1.9 Ω		95 ppm
19 Ω		27 ppm
190 Ω		17 ppm

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 2 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
1.9 kΩ 19 kΩ 190 kΩ 1.9 MΩ 19 MΩ		13 ppm 12 ppm 14 ppm 21 ppm 47 ppm
A3. DC Current Measuring Instrument	WI-SG-0011	
0.1 μA to 1 μA 1 μA to 10 μA 10 μA to 220 μA 220 μA to 2.2 mA 2.2 mA to 22 mA 22 mA to 100 mA 100 mA to 220 mA 220 mA to 1 A 1 A to 2.2 A 2.2 A to 11 A		300 ppm + 120 pA 340ppm + 1.2 nA 50 ppm + 8 nA 50 ppm + 8 nA 50 ppm + 80 nA 60 ppm + 0.8 μA (60 ppm + (200 x I ²)) ppm + 0.8 μA 80 ppm + 25 μA (80 + (10 x I ²)) ppm + 25 μA 360 ppm + 480 μA
A4. AC Voltage Measuring Instrument	WI-SG-0011	
	<u>Frequency (Hz)</u>	
0.22 mV to 2.2 mV	20 to 40 40 to 20 k 20 k to 50 k 50 k to 100 k	210 ppm + 5 μV 104 ppm + 5 μV 370 ppm + 5 μV 850 ppm + 7 μV
2.2 mV to 22 mV	20 to 40 40 to 20 k 20 k to 50 k 50 k to 100 k	210 ppm + 8 μV 105 ppm + 8 μV 320 ppm + 8 μV 850 ppm + 7 μV
22 mV to 220 mV	20 to 40 40 to 20k 20 k to 50 k 50 k to 100 k	210 ppm + 8 μV 105 ppm + 8 μV 320 ppm + 8 μV 850 ppm + 25 μV

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 3 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
220 mV to 2.2 V	<u>Frequency (Hz)</u>	
	20 to 40 40 to 20 k 20 k to 50 k 50 k to 100 k 100 k to 300 k 300 k to 500 k 500 k to 1 M	160 ppm + 26 μ V 75 ppm + 6 μ V 120 ppm + 16 μ V 250 ppm + 70 μ V 430 ppm + 130 μ V 1100 ppm + 350 μ V 0.22 % + 850 μ V
2.2 V to 22 V	20 to 40 40 to 20 k 20 k to 50 k 50 k to 100 k 100 k to 300 k 300 k to 500 k 500 k to 1 M	160 ppm + 260 μ V 75 ppm + 61 μ V 120 ppm + 160 μ V 250 ppm + 350 μ V 500 ppm + 1.5 mV 0.13 % + 4.3 mV 0.27 % + 8.5 mV
	22 V to 220 V	20 to 40 40 to 20 k 20 k to 50 k 50 k to 100 k
220 V to 1000 V	40 to 1 k 1 k to 20 k 20 k to 30 k	90 ppm + 4 mV 165 ppm + 6 mV 600 ppm + 11 mV
A5. AC Current Measuring Instrument	WI-SG-0011	
9 μ A to 220 μ A	<u>Frequency (Hz)</u>	
	20 to 40 40 to 1 k 1 k to 5 k 5 k to 10 k	350 ppm + 20 nA 140 ppm + 16 nA 600 ppm + 40 nA 0.16 % + 80 nA
220 μ A to 2.2 mA	20 to 40 40 to 1 k 1 k to 5 k 5 k to 10 k	360 ppm + 33 nA 140 ppm + 35 nA 600 ppm + 400 nA 0.16 % + 800 nA

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 4 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
2.2 mA to 22 mA	<u>Frequency (Hz)</u>	
	20 to 40	360 ppm + 330 nA
	40 to 1 k	140 ppm + 350 nA
	1 k to 5 k	600 ppm + 4 μ A
22 mA to 220 mA	5 k to 10 k	0.16 % + 8 μ A
	20 to 40	360 ppm + 3.3 μ A
	40 to 1 k	140 ppm + 3.5 μ A
	1 k to 5 k	600 ppm + 40 μ A
220 mA to 2.2 A	5 k to 10 k	0.16 % + 80 μ A
	20 to 1 k	650 ppm + 35 μ A
	1 k to 5 k	750 ppm + 80 μ A
	5 k to 10 k	0.85 % + 160 μ A
2.2 A to 11 A	20 to 1 k	460 ppm + 170 μ A
	1 k to 5 k	950 ppm + 380 μ A
	5 k to 10 k	0.36 % + 750 μ A
	A6. DC Voltage Source	WI-SG-0012
<u>Fixed Point</u>		
100 mV Standard		1.8 ppm
1 V Standard		1.2 ppm
10 V Ref. Standard		1.0 ppm
100 V Standard		1.2 ppm
1000 V Standard		1.5 ppm
<u>Range</u>		
0 mV to 100 mV		9 ppm + 2.4 μ V
100 mV to 1 V		7 ppm + 2.3 μ V
1 V to 10 V		6.9 ppm + 4.3 μ V
10 V to 100 V		6.9 ppm + 43 μ V
100 V to 1000 V		21 ppm + 280 μ V

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 5 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
<p>A7. Resistance Source</p> <p>1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1.9 Ω 19 Ω 190 Ω 1.9 kΩ 19 kΩ 190 kΩ 1.9 MΩ 19 MΩ</p>	<p>WI-SG-0012</p>	<p>11 ppm 7.0 ppm 5.1 ppm 4.9 ppm 3.4 ppm 4.9 ppm 9.6 ppm 11 ppm 52 ppm 8.2 ppm 6.6 ppm 5.1 ppm 4.8 ppm 3.3 ppm 4.8 ppm 9.5 ppm 10 ppm</p>
<p>A8. DC Current Source</p> <p><u>Fixed Point</u> 190 μA 1.9 mA 19 mA 190 mA 1 A 3 A 5 A 10 A</p> <p><u>Range</u> 0 nA to 100 nA 100 nA to 1 μA 1 μA to 10 μA 10 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 2 A 2 A to 10 A</p>	<p>WI-SG-0012</p>	<p>0.88 nA 11 nA 0.15 μA 1.5 μA 26 μA 0.18 mA 0.31 mA 0.61 mA</p> <p>60 ppm + 47 pA 29 ppm + 48 pA 29 ppm + 120 pA 29 ppm + 990 pA 30 ppm + 6.1 nA 30 ppm + 61 nA 46 ppm + 640 nA 140 ppm + 11 μA 170 ppm + 25 μA 390 ppm + 0.4 mA</p>

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 6 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
A9. AC Voltage Source	WI-SG-0012	
	<u>Frequency (Hz)</u>	
2 mV	10	3.6 μ V
	20	2.2 μ V
	40 to 20 k	1.7 μ V
	50 k	2.8 μ V
	100 k	3.8 μ V
	300 k	6.7 μ V
	500 k	10 μ V
	1 M	14 μ V
20 mV	10	5.5 μ V
	20	4.0 μ V
	40 to 20 k	2.7 μ V
	50 k	4.8 μ V
	100 k	6.7 μ V
	300 k	16 μ V
	500 k	22 μ V
	1 M	47 μ V
200 mV	10	34 μ V
	20	15 μ V
	40 to 20 k	7.8 μ V
	50 k	13 μ V
	100 k	27 μ V
	300 k	47 μ V
	500 k	68 μ V
	1 M	190 μ V
2 V	10	310 μ V
	20	110 μ V
	40 to 20 k	45 μ V
	50 k	81 μ V
	100 k	120 μ V
	300 k	310 μ V
	500 k	480 μ V
	1 M	1.9 mV

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 7 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
20 V	<u>Frequency (Hz)</u>	
	10	3.1 mV
	20	1.1 mV
	40 to 20 k	0.48 mV
	50 k	0.82 mV
	100 k	1.3 mV
	300 k	3.4 mV
	500 k	7.3 mV
200 V	10	31 mV
	20	11 mV
	40 to 20 k	5.9 mV
	50 k	12 mV
	100 k	17 mV
300 V	20 k	11 mV
600 V	50 k	70 mV
	100 k	400 mV
1000V	40 to 20 k	34 mV
	30 k	120 mV
A10. AC Current Source	WI-SG-0012	
190 µA	<u>Frequency (Hz)</u>	
	10	32 nA
	20	12 nA
1.9 mA	40 to 10k	6.9 nA
	10	0.32 µA
	20	0.13 µA
19 mA	40 to 10k	69 nA
	10	3.5 µA
	20	1.9 µA
190 mA	40 to 10k	1.6 µA
	10	35 µA
	20	19 µA
1 A	40 to 10k	16 µA
	40 to 10k	92 µA
10 A	40 to 10k	1.2 mA

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 8 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
A11. On-site Calibration		
a) DC Current Source 0 pA to 1 pA 1 pA to 10 pA 10 pA to 100 pA 0.1 nA to 1 nA 1 nA to 10 nA 10 nA to 100 nA 0.1 µA to 1 µA 1 µA to 10 µA 10 µA to 100 µA 0.1 mA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 0.1 A to 1 A 1 A to 1.5 A	FS-0007-SG	0.12% + 0.66 fA 0.12% + 0.62 fA 0.024% + 0.55 fA 0.012% + 0.21 pA 0.012% + 0.21 pA 0.012% + 0.29 pA 0.012% + 9.2 pA 0.012% + 0.030 nA 0.0083% + 0.29 nA 0.0083% + 3.2 nA 0.0094% + 29 nA 0.012% + 0.29 µA 0.035% + 6.9 µA 0.1% + 29 µA
b) DC Current Measure 0 pA to 1 pA 1 pA to 10 pA 10 pA to 100 pA 0.1 nA to 1 nA 1 nA to 10 nA 10 nA to 100 nA 0.1 µA to 1 µA 1 µA to 10 µA 10 µA to 100 µA 0.1 mA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 0.1 A to 1 A 1 A to 1.5 A	FS-0007-SG	0.12% + 0.66 fA 0.12% + 0.62 fA 0.024% + 0.55 fA 0.012% + 0.21 pA 0.012% + 0.21 pA 0.012% + 0.29 pA 0.012% + 9.2 pA 0.012% + 30 pA 0.0083% + 0.29 nA 0.0083% + 3.2 nA 0.0094% + 29 nA 0.012% + 0.29 µA 0.035% + 6.9 µA 0.1% + 29 µA
c) DC Voltage Source 0 V to 0.2 V 0.2 V to 2 V 2 V to 20 V 20 V to 200 V	FS-0007-SG	0.0026% + 3.8 µV 0.0016% + 4.5 µV 0.0017% + 0.17 mV 0.0029% + 0.71 mV

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 9 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
<p>d) DC Voltage Measure 0 V to 0.2 V 0.2 V to 2 V 2 V to 20 V 20 V to 200 V</p> <p>B. RF and Probe - Measuring Instruments</p> <p>B1. a) DC Volts - 0 V</p> <p>b) 1 M Ω load, 50 Ω load 0 to 100 mV 100 mV to 1.0 V 1.0 V to 5.6 V</p> <p>c) 1 MΩ load 5.6 V to 222.4 V</p> <p>B2. Sinewave Flatness 50 Ω load, 50 kHz to 10 MHz reference, V (p-p)</p> <p>4.4 mV to 5.56 V 4.4 mV to 5.56 V 4.4 mV to 3.336 V 4.4 mV to 3.336 V 4.4 mV to 2.224 V</p> <p>B3. AC Voltage 50 Ω, Sinewave V (p-p)</p> <p>4.4 mV to 5.56 V 4.4 mV to 3.34 V 4.4 mV to 2.2 V</p>	<p>FS-0007-SG</p> <p>1 MHz to 100 MHz 100 MHz to 550 MHz 500 MHz to 1.1 GHz 1.1 GHz to 2.5 GHz 2.5 GHz to 3.2 GHz</p> <p>1 MHz to 550 MHz 550 MHz to 2.5 GHz 2.5 GHz to 3.2 GHz</p>	<p>0.0026% + 3.8 μV 0.0016% + 4.5 μV 0.0017% + 0.17 mV 0.0029% + 0.71 mV</p> <p>15 μV</p> <p>0.05 % + 26 μV 0.022 % + 65 μV 0.026 % + 50 μV</p> <p>0.03 %</p> <p>0.22 dB 0.27 dB 0.37 dB 0.47 dB 0.48 dB</p> <p>3.3 % 6.3 % 12 %</p>

Schedule



Certificate No. : LA-1997-0124-C

Issue No. : 22

Date : 06 January 2021

Page : 10 of 10

MEASURED QUANTITIES/ INSTRUMENTS/ RANGE TO BE CALIBRATED	CONDITION/ INDEPENDENT VARIABLE	CALIBRATION AND MEASUREMENT CAPABILITY (CMC *)
B4. Resistance (RF scope) 50 Ω 75 Ω 1 MΩ		0.13 % 0.17 % 0.13 %
B5. Frequency and Period 12 kHz to 3.2 GHz		0.27 ppm
B6. Time Base Measurement 450.50 ps to 55.0 s		0.27 ppm
B7. Frequency Source 0.2 Hz to 2.7 GHz	0.2 Hz to 2.7 GHz	25 x 10 ⁻¹⁰ per year **
B8. Rise Time a) Source (Reference) 15.0 ps b) Measure Less than 17.5 ps		2.5 ps 3.3 ps

* CMC is expressed as an expanded uncertainty estimated at a level of confidence of approximately 95 %.

** Frequency source using 10 MHz External Reference frequency standard.

Approved signatories

Mr Gary Tan Tjiang Thung All items
Mr Raul T. Alenton All items
Mr Kung Sie Ang Item A - Electrical DC/LF

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.