SINGAPORE LABORATORY ACCREDITATION SCHEME

Accredited Laboratory SAC-SINGLAS

Schedule

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Certificate No. : LA-2023-0845-C

Issue No. : 1

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Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A ELECTRICAL – DC/LF		
1. Resistance measuring instrument Lab In-House procedure UNI-E001 Rev:0	0 Ω – 12 Ω >12 Ω – 120 Ω >120 Ω – 1.2 kΩ >1.2 kΩ – 12 kΩ >12 kΩ – 120 kΩ >120 kΩ – 1.2 MΩ >1.2 MΩ – 12 MΩ >12 MΩ – 120 MΩ >120 MΩ – 1200 MΩ	0.011 Ω 0.13 % 0.11 % 0.019 % 0.011 % 0.011 % 0.021 % 0.062 % 0.42 %
2. DC Voltage measuring instrument Lab-In-House procedure UNI-E001 Rev:0	0 mV – 120 mV >120 mV – 1.2 V >1.2 V – 12 V >12 V – 120 V >120 V – 1020 V	0.0024 mV 0.0011 % 0.0017 % 0.0024 % 0.0024 %
3. AC Voltage measuring instruments Lab-In-House procedure UNI-E001 Rev:0	1.0 mV to 12 mV 3 Hz to 5 Hz >5 Hz to 10 kHz >10 kHz to 20 kHz >20 kHz to 50 kHz >50 kHz to 100 kHz >100 kHz to 500 kHz	 1.6% 1.0 % 0.65 % 0.66 % 1.7 % 3.9 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
	12 mV to 120 mV	
	3 Hz – 5 Hz	0.32 %
	>5 Hz – 10 kHz	0.17 %
	>10 kHz – 20 kHz	0.065 %
	>20 kHz – 50 kHz	0.11 %
	>50 kHz – 100 kHz	0.25 %
	>100 kHz – 500 kHz	1.3 %
	120 mV – 1.2 V	
	3 Hz – 5 Hz	0.42 %
	>5 Hz – 10 Hz	0.15 %
	>10 Hz – 40 Hz	0.6 %
	>40 Hz – 20 kHz	0.13 %
	>20 kHz – 50 kHz	0.047 %
	>50 kHz – 100 kHz	0.11 %
	>100 kHz – 500 kHz	0.41 %
	1.2 V – 12 V	
	3 Hz – 5 Hz	0.33 %
	>5 Hz – 10 Hz	0.5 %
	>10 Hz – 40 Hz	0.6 %
	>40 Hz – 20 kHz	0.018 %
	>20 kHz – 50 kHz	0.035 %
	>50 kHz – 100 kHz	0.081 %
	> 100 kHz – 500 kHz	0.25
	12 V – 120 V	
	>3 Hz – 5 Hz	0.32 %
	>5 Hz – 10 Hz	0.50 %
	>10 Hz – 40 Hz	0.045 %
	>40 Hz – 20 kHz	0.092 %
	>20 kHz – 50 kHz	0.036 %
	>50 kHz – 100 kHz	0.082 %
	120 V – 330 V	
	3 Hz – 5 Hz	0.50 %
	>5 Hz – 10 Hz	0.16 %
	>10.1 Hz – 20 kHz	0.021 %
	>20 kHz – 50 kHz	0.039 %
	>50 kHz – 100 kHz	0.17 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
	330V – 1020 V	
	3 Hz – 5 Hz	0.29 %
	>5 Hz – 10 Hz	0.12 %
	>10 Hz – 10 kHz	0.04 %
4. DC Current measuring instruments		
Lab-In-House procedure UNI-E001 Rev:0	0 µA – 120 µA	0.021 µA
	>120 µA – 1.2 mA	0.045 %
	>1.2 mA – 12 mA	0.019 %
	>12 mA – 120 mA	0.02 %
	>120 mA – 1.2 A	0.029 %
	>1.2 A – 3.1 A	0.044 %
	>3.1 A – 12 A	0.041 %
	>12 A – 30 A	0.11 %
5. DC Current Clamp measuring instruments	0 mA – 20 mA	0.14 mA
	20 mA – 100 mA	0.72 %
Lab-In-House procedure UNI-E002 Rev:0	0.1 A – 4 A	1.0 %
	>4 A – 40 A	0.7 %
	>40 A – 60 A	0.67 %
	>60 A – 200 A	0.67 %
	>200 A – 300 A	0.67 %
	>300 A – 1500A	0.67 %
6. AC Current measuring instruments	**10 µA – 120 µA**	
	>3 Hz – 22.5 Hz	0.14 %
Lab-In-House procedure UNI-E001 Rev:0	>22.5 Hz – 45 Hz	0.06 %
	>45 Hz – 1 kHz	0.06 %
	>1 kHz – 5 kHz	0.06 %
	>5 kHz – 10 kHz	0.14 %
	>10 kHz – 30 kHz	3.4 %
	120 µA – 1.2 mA	
	3 Hz – 22.5 Hz	0.14 %
	>22.5 Hz – 45 Hz	0.11 %
	>45 Hz – 1 kHz	0.12 %
	>1 kHz – 5 kHz	0.11 %
	>5 kHz – 10 kHz	0.24 %
	>10 kHz – 30 kHz	4.8 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
	1.2 mA – 12 mA	
	3 Hz – 45 Hz	0.11 %
	>45 Hz – 1 kHz	0.11 %
	>1 kHz – 5 kHz	0.11 %
	>5 kHz – 10 kHz	0.24 %
	>10 kHz – 30 kHz	1.4 %
	12 mA – 120 mA	
	3 Hz – 45 Hz	0.11 %
	>45 Hz – 1 kHz	0.06 %
	>1 kHz – 5 kHz	0.018 %
	>5 kHz – 10 kHz	0.24 %
	>10 kHz – 30 kHz	1.4 %
	120 mA – 1.2 A	
	3 Hz – 45 Hz	0.34 %
	>45 Hz – 1 kHz	0.068 %
	>1 kHz – 5 kHz	0.09 %
	>5 kHz – 10 kHz	0.5 %
	>10 kHz – 30 kHz	0.8 %
	1.2 A – 3.1 A	
	3 Hz – 45 Hz	0.25 %
	>45 Hz – 1 kHz	0.06 %
	>1 kHz – 5 kHz	0.06 %
	>5 kHz – 10 kHz	0.3 %
	3.1 A – 12 A	
	3 Hz – 45 Hz	0.12 %
	>45 Hz – 1 kHz	0.05 %
	>1 kHz – 5 kHz	0.07 %
	>5 kHz – 10 kHz	0.29 %
	12 A – 30.2 A	
	3 Hz – 45 Hz	0.21 %
	>45 Hz – 1 kHz	0.14 %
	>1 kHz – 5 kHz	0.57 %

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7. AC Current clamp measuring instrument	**(30 Hz – 60 Hz)**	
	10 mA – 40 mA	0.76 %
Lab-In-House procedure UNI-E002 Rev:0	40 mA – 400 mA	0.70 %
	0.4 A – 4 A	0.67 %
	>4 A – 40 A	0.68 %
	>40 A – 60 A	0.72 %
	>60 A – 200 A	0.69 %
	>200 A – 300 A	0.68 %
	>300 A – 1500A	0.67 %
8. Frequency measuring instruments	0.01 Hz – 119.99 Hz	0.018 %
	120.0 Hz – 1199.9 Hz	0.0014 %
Lab-In-House procedure UNI-E001 Rev:0	1.200 kHz – 11.999 kHz	0.0011 %
	12.00 kHz – 119.99 kHz	0.00057 %
	120.1 kHz – 1199.9 kHz	0.53 %
	1.200 MHz – 2.000 MHz	0.00027 %
9. Capacitance measuring instruments	0.2 nF – 1.2 nF	2.3 %
	>1.2 nF – 12 nF	0.6 %
Lab-In-House procedure UNI-E001 Rev:0	>12 nF – 120 nF	0.4 %
	>120 nF – 1.2 µF	0.4%
	>1.2 µF – 12 µF	0.4 %
	>12 µF – 120 µF	0.4 %
	>120 µF – 1.2mF	0.45 %
	>1.2 mF – 12 mF	0.49 %
	>12 mF – 120 mF	0.8 %
10. Inductance measuring instruments	13 µH – 120 µH	2.0 %
	>120 µH – 1.2 mH	1.0 %
Lab-In-House procedure UNI-E001 Rev:0	>1.2 mH – 12 mH	1.0 %
	>12 mH – 120 mH	1.0 %
	>120 mH – 1.2 H	1.0 %
	>1.2 H – 12 H	1.0 %
	>12 H – 120 H	1.1 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
11. Resistance sourcing instruments	0.01 Ω – 1 Ω	0.16 %
	>1 Ω – 10 Ω	0.0058 %
Lab-In-House procedure UNI-E003 Rev:0	>10 Ω – 100 Ω	0.0042 %
	>100 Ω – 1 kΩ	0.002%
	>1 kΩ – 10 kΩ	0.003 %
	>10 kΩ – 100 kΩ	0.004 %
	>100 kΩ – 1 MΩ	0.008 %
	>1 MΩ – 10 MΩ	0.02 %
	>10 MΩ – 100 MΩ	0.13 %
	>100 MΩ – 1 GΩ	0.17 %
	>1 GΩ – 10 GΩ	1.2 %
12. DC Voltage sourcing instruments	0 mV – 100 mV	0.0021 mV
	>0.11 V – 1 V	0.0012 %
Lab-In-House procedure UNI-E003 Rev:0	>1 V – 10 V	0.001 %
	>10 V – 100 V	0.002 %
	>100 V – 1000 V	0.005 %
13. AC Voltage sourcing instruments	**1 mV – 10 mV**	
	3 Hz – 2 kHz	0.26 %
Lab-In-House procedure UNI-E003 Rev:0	>2 kHz – 10 kHz	0.26 %
	>10 kHz – 30 kHz	0.27 %
	>30 kHz – 100 kHz	0.53 %
	>100 kHz – 300 kHz	1.9 %
	10 mV – 100 mV	
	3 Hz – 2 kHz	0.57 %
	>2 kHz – 10 kHz	0.57 %
	>10 kHz – 30 kHz	0.07 %
	>30 kHz – 100 kHz	0.19 %
	>100 kHz – 300 kHz	1.0 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
	100 mV – 1 V	
	3Hz – 2 kHz	0.02 %
	1 V – 10 V	
	3Hz – 10 kHz	0.03 %
	>10 kHz – 30 kHz	0.05 %
	>30 kHz – 100 kHz	0.14 %
	>100 kHz – 300 kHz	0.66 %
	10 V – 100 V	
	3 Hz – 2 kHz	0.57 %
	>2 kHz – 10 kHz	0.57 %
	>10 kHz – 30 kHz	0.10 %
	>30 kHz – 100 kHz	0.15 %
	>100 kHz – 300 kHz	1.3 %
	100 V – 1000 V	
	3 Hz – 2 kHz	0.05 %
	>2 kHz – 10 kHz	0.05 %
	>10 kHz – 30 kHz	0.10 %
14. DC Current sourcing instruments	0 µA – 10 µA	0.0018 µA
	>10 µA – 100 µA	0.017 %
Lab-In-House procedure UNI-E003 Rev:0	>100 µA – 1 mA	0.025 %
	>1 mA – 10 mA	0.012 %
	>10 mA – 100 mA	0.02 %
	>100 mA – 1 A	0.13 %
	>1 A – 10 A	0.1 %
	1>0 A – 30 A	0.30 %
15. AC current sourcing instruments	**10 µA – 100 µA**	
	3 Hz – 2 kHz	0.40 %
Lab-In-House procedure UNI-E003 Rev:0	**100 µA – 1 mA**	
	3 Hz – 10 kHz	0.15 %
	1 mA – 10 mA	
	3 Hz – 30 kHz	0.17 %
	>30 kHz – 100 kHz	0.64 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
	10 mA – 100 mA	
	3 Hz – 2 kHz	0.3 %
	>2 kHz – 10 kHz	0.2 %
	>10 kHz – 30 kHz	0.21 %
	100 mA – 1 A	
	3 Hz – 2 kHz	0.57 %
	>2 kHz – 10 kHz	0.21 %
	>10 kHz – 30 kHz	0.2 %
	1 A – 10 A	
	10 Hz – 2 kHz	0.2 %
	>2 kHz – 10 kHz	0.2 %
	10 A – 30 A	
	10 Hz – 2 kHz	0.19 %
	>2 kHz – 10 kHz	0.19 %
16. Frequency sourcing instruments	1 Hz – 10 Hz	0.006 %
	>10 Hz – 1 kHz	0.03 %
Lab-In-House procedure UNI-E003 Rev:0	>1 kHz – 10 kHz	0.0003 %
	>10 kHz – 100 kHz	0.0002 %
	>100 kHz – 1 MHz	0.001 %
	>1 MHz – 10 MHz	0.001 %
	>10 MHz – 100 MHz	0.0002 %
17. Capacitance sourcing instruments	0.1 nF – 1.2 nF	2.4 %
	>1.2 nF – 12 nF	0.4 %
Lab-In-House procedure UNI-E003 Rev:0	>12 nF – 120 nF	0.2 %
	>120 nF – 1.2 µF	0.17 %
	>1.2 µF – 12 µF	0.76 %
	>12 µF – 120 µF	0.3 %
	>120 µF – 1.2 mF	0.1 %
	>1.2 mF – 12 mF	0.2 %
	>12 mF – 100 mF	0.1 %

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18. DC Power measuring instruments	0.02 W – 0.5 W	0.74 %
	>0.5 W – 5 W	0.13%
Lab-In-House procedure UNI-E001 Rev:0	>5 W – 50 W	0.13 %
	>50 W – 1000 W	0.22 %
	>1 kW – 5 kW	0.33 %
	>5 kW – 20 kW	0.34 %
	>20 kW – 30 kW	0.33 %
	With Coil 30 kW – 1500 kW	1.0 %
19. AC Power measuring instruments	0.02 W – 0.5 W	0.60 %
	>0.5 W – 5 W	0.14%
Lab-In-House procedure UNI-E001 Rev:0	>5 W – 50 W	0.23 %
	>50 W – 1000 W	0.7 %
	>1 kW – 5 kW	2.3 %
	>5 kW – 20 kW	2.3 %
	>20 kW – 30 kW	3 %
	With Coil 30 kW – 1500 kW	4 %
20. Low Resistance (Earth resistance) – measuring instruments	100 mΩ – 0.199 Ω	0.013 Ω
	0.2 Ω – 0.499 Ω	0.013 Ω
	0.5 Ω – 1.999 Ω	0.051 Ω
Lab-In-House procedure UNI-E004 Rev:0	2 Ω – 4.99 Ω	0.019 Ω
	5 Ω – 29.9 Ω	0.026 Ω
	30 Ω – 199.9 Ω	0.12 Ω
	200 Ω – 499.99 Ω	0.49 Ω
	500 Ω – 1.999 kΩ	0.0014 kΩ
	2 kΩ – 4.99 kΩ	0.005 kΩ
	5 kΩ – 10 kΩ	0.014 kΩ
High Resistance (Insulation resistance) – measuring instruments	10 kΩ – 19.999 kΩ	0.025 kΩ
	20 kΩ – 39.99 kΩ	0.047 kΩ
	40 kΩ – 99.99 kΩ	0.12 kΩ
	100 kΩ – 199.99 kΩ	0.25 kΩ
	200 kΩ – 999.9 kΩ	0.47 kΩ
	1 MΩ – 1.999 MΩ	0.0081 MΩ
	2 MΩ – 9.999 MΩ	0.01 MΩ

	Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
		10 MΩ – 19.999 MΩ	0.092 MΩ
		20 MΩ – 199.99 MΩ	0.60 MΩ
		200 MΩ – 999.9 MΩ	1.4 MΩ
		1 GΩ – 1.9 GΩ	0.074 GΩ
		2 GΩ – 10 GΩ	0.077 GΩ
		100 GΩ	0.15 GΩ
	High Resistance (Insulation resistance source with R multiplier) – measuring Instruments	100 GΩ – 999.9 GΩ	2.5 GΩ
21.	Ground Bond Resistance measuring instruments (fixed points)	30 mΩ	1.3 mΩ
		55 mΩ	2.1 mΩ
		97 mΩ	2.3 mΩ
	Lab-In-House procedure UNI-E004 Rev:0	350 mΩ	4.1 mΩ
		490 mΩ	4.4 mΩ
		900 mΩ	9.2 mΩ
		1.7 Ω	0.1 Ω
		4.7 Ω	0.1 Ω
		9 Ω	0.1 Ω
		17 Ω	0.1 Ω
		47 Ω	0.4 Ω
		90 Ω	0.6 Ω
		170 Ω	1.2 Ω
		470 Ω	3.0 Ω
		900 Ω	5.9 Ω
		1.7 kΩ	0.08 kΩ
22.	Leakage Current measuring instruments	0.1 mA – 30 mA	1.7 %
	Lab-In-House procedure UNI-E004 Rev:0		
23.	Residual Current measuring instruments		
	Lab-In-House procedure UNI-E004 Rev:0		
	Trip current:	3 mA – 3000 mA	1.8 %

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
24. Oscilloscope Calibration		
Lab-In-House procedure UNI-E005 Rev:0		
Vertical Deflection @ DC Signal	**50 Ω Input**	
	± 1 mV – ± 24.999 mV	2 %
	± 25 mV – ± 109.99 mV	0.6 %
	± 110 mV – ± 2.1999 V	6.4 %
	± 2.2 V – ± 6.6 V	0.5 %
	1 MΩ Input	
	± 1 mV – ± 24.999 mV	3.8 %
	± 25 mV – ± 109.99 mV	0.49 %
	± 110 mV – ± 2.1999 V	0.47%
	± 2.2 – ± 10.999 V	0.46 %
	± 11 V – ± 130 V	0.46 %
Vertical Deflection @ AC Signal	**50 Ω Input**	
	1 mVp-p to ± 24.999 mVp-p	1.9 %
	25 mV p-p – ±109.99mVp-p	0.6 %
	110 mVp-p – ± 2.1999 Vp-p	5.3 %
	2.2 Vp-p – ± 6.6 Vp-p	0.5 %
	1 MΩ Input	
	± 1 mVp-p – ± 24.999 mVp-p	3.2 %
	± 25 mV – ± 109.99 mVp-p	0.51 %
	± 110 mVp-p – ± 2.1999 Vp-p	0.48%
	± 2.2 Vp-p – ± 10.999 Vp-p	0.47 %
	± 11 Vp-p – ± 130 Vp-p	0.47 %
Horizontal Deflection	2 ns – 5 ns	0.063 %
	>5 ns – 10 ns	0.081 %
	>10 ns – 20 ns	0.073 %
	>20 ns – 50 ns	0.061 %
	>50 ns – 50 µs	0.095 %
	>50 µs – 20 ms	0.073 %
	>20 ms – 50 ms	0.061 %
	>50 ms – 5 s	0.14%

	Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
	Bandwidth	50 kHz – 100 MHz	0.26 dB
		>100 MHz – 300 MHz	0.30 dB
		>300 MHz – 600 MHz	0.48 dB
		>600 MHz – 1100 MHz	0.57 dB
25.	Calibration of Stop Watch Timer	1 s – 60 s	0.25 s
		61 s – 600 s	0.13 s
	Lab In-House procedure UNI-E006 Rev:0	601 s – 1200 s	0.13 s
		1201 s – 1800 s	0.13 s
		1801 s – 3600 s	0.13 s
		3601 s – 7200 s	0.13 s
		7201 – 10800 s	0.13 s
B.	**TEMPERATURE**		
1.	a) RTD ,PRT Sensor with Indicator & Temperature Measuring instruments (Lab)		0.011 °C
		-80 °C – -40 °C	
		>-40 °C – 0 °C	0.01 °C
		>0 °C – 50 °C	0.01 °C
	Lab In-House procedure UNI-T001 Rev:0	>50 °C – 140 °C	0.01 °C
		>140 °C – 210 °C	0.01 °C
		>210 °C – 270 °C	0.011 °C
		>270 °C – 450 °C	0.018 °C
		>450 °C – 500 °C	0.02 °C
		>500 °C – 660 °C	0.39 °C
	(Site)	-95 °C – 0 °C	0.066 °C
		>0 °C – 60 °C	0.033 °C
		>60 °C – 140 °C	0.047 °C
		>140 °C – 270 °C	0.26 °C
		>270 °C – 450 °C	0.33 °C
		>450 °C – 660 °	0.39 °C

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
b) Thermocouple Wire with Indicator (Lab)	-80 °C - -40 °C	0.17 °C
	>-40 °C – 0 °C	0.17 °C
	>0 °C – 50 °C	0.17 °C
	>50 °C – 140 °C	0.17 °C
	>140 °C - -210 °C	0.17 °C
	>210 °C – 270 °C	0.17 °C
	>270 °C – 450 °C	0.17 °C
	>450 °C – 500 °C	0.17 °C
	>500 °C – 660 °C	0.53 °C
	>660 °C – 800 °C	0.9 °C
	>800 °C – 1000 °C	0.9 °C
(Site)	-95 °C – 0 °C	0.29 °C
	>0 °C – 60 °C	0.24 °C
	>60 °C – 140 °C	0.24 °C
	>140 °C – 270 °C	0.31 °C
	>270 °C – 450 °C	0.33 °C
	>450 °C – 660 °C	0.4 °C
(C) Temperature Indicator with other Sensors (Lab)	-80 °C – 0 °C	0.14 °C
	>0 °C – 50 °C	0.12 °C
	>50 °C – 140 °C	0.12 °C
	>140 °C – 210 °C	0.13 °C
	>210 °C – 270 °C	0.13 °C
	>270 °C – 450 °C	0.13 °C
	>450 °C – 500 °C	0.13 °C
	>500 °C – 660 °C	0.53 °C
(Site)	-95 °C – 0 °C	0.17 °C
	>0 °C – 60 °C	0.13 °C
	>60 °C – 140 °C	0.13 °C
	>140 °C – 270 °C	0.28 °C
	>270 °C – 450 °C	0.35 °C
	>450 °C – 660 °C	0.4 °C

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2. Fixed Point RTD Sensor	Approx. -196.0 °C	0.012 °C
	0.01 (TPW)	3 mK
Lab In-House procedure UNI-T002 Rev:0	29.7647 (Gallium)	3 mK
	660.3226 (Aluminium)	9 mK
Thermistor	0.01 (TPW)	3 mK
	29.7647 (Gallium)	3 mK
3. RTD Sensor without Indicator, PRT Sensor without Indicator & Temperature measuring instruments (Lab)	-80 °C - -40 °C	0.01 °C
	>-40 °C – 0°C	0.01 °C
Lab In-House procedure UNI-T003 Rev:0	>0 °C – 50 °C	0.01 °C
	>50 °C – 140 °C	0.012 °C
	>140 °C – 210 °C	0.012 °C
	>210 °C – 270 °C	0.02 °C
	>270 °C – 500 °C	0.03 °C
	>500 °C – 660 °C	0.39 °C
(Site)	-95 °C – 60 °C	0.6 °C
	>60 °C – 140 °C	0.35 °C
	>140 °C – 270 °C	0.43 °C
	>270 °C – 450 °C	0.47 °C
	>450 °C – 660 °C	0.52 °C
4. Thermocouple Wire without Indicator (Lab)	-80 °C - -40 °C	0.8 °C
	>-40 °C – 0 °C	0.8 °C
Lab In-House procedure UNI-T004 Rev:0	>0 °C – 50 °C	0.36 °C
	>50 °C – 140 °C	0.36 °C
	>140 °C – 210 °C	0.36 °C
	>210 °C – 270 °C	0.36 °C
	>270 °C – 450 °C	0.36 °C
	>450 °C – 500 °C	0.36°C
	>500 °C – 660 °C	0.5 °C
	>660 °C – 800 °C	1.0 °C
	>800 °C – 1000 °C	1.1 °C

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
(Site)	-95 °C – 60 °C >60 °C – 140 °C >140 °C – 280 °C >280 °C – 450 °C >450 °C – 660 °C	0.72 °C 0.71 °C 0.77 °C 0.78 °C 0.8 °C
4 (a) Connecting Thermocouple wire		
Type S	0 °C – 30 °C	0.0003 mV
Type R		0.0003 mV
Type J		0.001 mV
Type K		0.0008 mV
Type N		0.0005 mV
Type T		0.0008 mV
Type E		0.0012 mV
(b) C/J Thermocouple Wire		
Type S	0 °C – 30 °C	0.0002 mV
Type R		0.0002 mV
Type J		0.0007 mV
Type K		0.0006 mV
Type N		0.0006 mV
Type T		0.0006 mV
Type E		0.0008 mV

Certificate No. : LA-2023-0845-C Issue No. : 01

Date : 03 August 2023 Page : 16 of 20

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)	
5. Thermocouple Indicator Lab In-House procedure UNI-T005 Rev:0			
		Lab	Site
Type K	-200 °C - -100 °C	0.51 °C	0.91 °C
	>-100 °C - -25 °C	0.43 °C	0.55 °C
	>-25 °C – 120 °C	0.46 °C	0.55 °C
	>120 °C – 600 °C	0.46 °C	0.55 °C
	>600 °C – 1000 °C	0.56 °C	0.72 °C
	>1000 °C – 1372 °C	0.56 °C	0.91 °C
Type: N	-200 °C - -100 °C	0.68 °C	0.68 °C
	>-100 °C - -25 °C	0.59 °C	0.82 °C
	>-25 °C – 120 °C	0.58 °C	0.82 °C
	>120 °C – 410 °C	0.61 °C	0.82 °C
	>410 °C – 1000 °C	0.61 °C	0.82 °C
	>1000 °C – 1300 °C	0.61 °C	0.91 °C
Type: J	210 - -100 °C	0.57 °C	0.91 °C
	>-100 °C - -30 °C	0.51 °C	0.64 °C
	>-30 °C – 150 °C	0.52 °C	0.64 °C
	>150 °C – 760 °C	0.54 °C	0.64 °C
	>760 °C – 1000 °C	0.54 °C	0.81 °C
	>1000 °C – 1200 °C	0.54 °C	0.81 °C
Type: T	-250 °C – -150 °C	0.86 °C	2.2 °C
	>-150 °C – 0 °C	0.47 °C	0.55 °C
	>0 °C – 120 °C	0.46 °C	0.55 °C
	>120 °C – 400 °C	0.46 °C	0.55 °C
Type: R	0 °C – 250 °C	0.91 °C	2.0 °C
	>250 °C – 400 °C	0.72 °C	1.5 °C
	>400 °C – 1000 °C	0.76 °C	1.5 °C
	>1000 °C – 1770 °C	0.76 °C	1.5 °C

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)	
		(Lab)	(Site)
Type: S	0 °C – 250 °C	0.82 ° C	2.0 °C
	>250 °C – 1000 °C	0.72 °C	1.3 °C
	>1000 °C – 1400 °C	0.79 °C	1.3 °C
	>1400 °C – 1760 °C	0.79 °C	1.6 °C
Type: E	-250 °C - -150 °C	0.66 °C	1.7 °C
	>-150 °C - -25 °C	0.48 °C	0.6 °C
	>-25 °C – 350 °C	0.49 °C	0.6 °C
	>350 °C – 650 °C	0.52 °C	0.68 °C
	>650 °C – 1000 °C	0.52 °C	0.68 °C
6. Thermocouple Simulator Lab In-House procedure UNI-T005 Rev:0		(Lab)	(Site)
Type: K	-200 °C - -100 °C	0.51 °C	0.62 °C
	>-100 °C - -25 °C	0.42 °C	0.55 °C
	>25 °C – 120 °C	0.46 °C	0.55 °C
	>120 °C – 600 °C	0.46 °C	0.55 °C
	>600 °C – 1000 °C	0.56 °C	0.55 °C
	>1000 °C – 1372 °C	0.56 °C	0. 55 °C
Type: N	-200 °C - -100 °C	0.68 °C	0.91 °C
	>-100 °C - -25 °C	0.58 °C	0.82 °C
	>-25 °C – 120 °C	0.58 °C	0.82 °C
	>120 °C – 410 °C	0.61 °C	0.82 °C
	>410 °C – 1000 °C	0.61 °C	0.68 °C
	>1000 °C – 1300 °C	0.61 °C	0. 68 °C
Type: J	210 °C - -100 °C	0.57 °C	0.63 °C
	>-100 °C - -30 °C	0.51 °C	0.57 °C
	>-30 °C – 150 °C	0.52 °C	0.57 °C
	>150 °C – 760 °C	0.52 °C	0.57 °C
	>760 °C – 1000 °C	0.54 °C	0.63 °C
	>1000 °C – 1200 °C	0.54 °C	0.63 °C

Schedule

Accredited Laboratory SAC - SINGLAS

Certificate No. : LA-2023-0845-C Issue No. : 01

Date : 03 August 2023 Page : 18 of 20

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)	
		(Lab)	(Site)
Type: T	-250 °C - -150 °C	0.86 °C	1.3 °C
	>-150 °C – 0 °C	0.50 °C	0.61 °C
	>0 °C – 120 °C	0.46 °C	0.61 °C
	>120 °C – 400 °C	0.46 °C	0.61 °C
Type: R	0 °C – 250 °C	0.91 °C	1.6 °C
	>250 °C – 400 °C	0.72 °C	1.4 °C
	>400 °C – 1000 °C	0.67 °C	1.4 °C
	>1000 °C – 1770 °C	0.72 °C	1.4 °C
Type: S	0 °C – 250 °C	0.79 °C	1.6 °C
	>250 °C – 1000 °C	0.72 °C	1.3 °C
	>1000 °C – 1400 °C	0.76 °C	1.4 °C
	>1400 °C – 1760 °C	0.76 °C	1.3 °C
Type: E	-250 °C - -150 °C	0.65 °C	0.91 °C
	>-150 °C - -25 °C	0.45 °C	0.64 °C
	>-25 °C – 350 °C	0.47 °C	0.64 °C
	>350 °C – 650 °C	0.56 °C	0.57 °C
	>650 °C – 1000 °C	0.51 °C	0.57 ° C
7. RTD and PRT Indicator			
Lab In-House procedure UNI-T005 Rev:0	-200 °C - -80 °C	0.06 °C	0.1 °C
	>-80 – 0 °C	0.06 °C	0.1 °C
	>0 °C – 100 °C	0.07 °C	0.1 °C
(Lab / Site)	>100 °C – 300 °C	0.1 °C	0.15 °C
	>300 °C – 400 °C	0.11 °C	0.17 °C
TYPE: PT 385 (100Ω)	>400 °C – 630 °C	0.14 °C	0.22 °C
	>630 °C – 800 °C	0.23 °C	0.25°C
8. RTD Simulator			
Lab In-House procedure UNI-T006 Rev:0	-200 °C – 80 °C	0.02 °C	0.15 °C
	>80 °C – 100 °C	0.01 °C	0.15 °C
	>100 °C – 200 °C	0.01 °C	0.16 °C
(Lab / Site)	>200 °C – 400 °C	0.01 °C	0.27 °C
	>400 °C – 800 °C	0.01 °C	0.27 °C
TYPE: PT 385 (100Ω)	-		

Certificate No. : LA-2023-0845-C Issue No. : 01

Date : 03 August 2023 Page : 19 of 20

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
9. Dry Block Calibrator		
Lab In-House procedure UNI-T007 Rev:0	-95 °C – 140 °C >140 °C – 450 °C >450 °C – 600 °C	0.035 °C 0.05 °C 0.052 °C
(Lab / Site)		
10. Non-Contact Temperature Infrared Thermometer / Thermal imager		
Lab In-House procedure UNI-T008 Rev:0	35 °C – 100 °C >100 °C – 200 °C >200 °C – 350 °C >350 °C – 500 °C	1.1 °C 2.1 °C 2.6 °C 3.7 °C
Emissivity: 0.90 – 1.00		
Spectral Band: 8 to 14 µm		
11. Humidity / Temperature measuring instruments		
Lab In-House procedure UNI-T009 Rev:0		
(Lab / Site) (Used Reference Probe)		
Temperature:	5 °C – 50 °C	0.3 °C
Humidity:	(5 – 90) % relative humidity	2.4 % relative humidity
Lab : (Used Chilled Mirror) Temperature	15 °C – 50 °C	0.2 °C
Humidity	(40 – 90) % relative humidity	1.2 % relative humidity
Fixed Temperature @23°C	(05 – 50) % relative humidity (50 – 90) % relative humidity	0.7 % relative humidity 1.1 % relative humidity

Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2023-0845-C Issue No. : 01

Date : 03 August 2023 Page : 20 of 20

Scope / Instruments / Location / Method	Range to be Calibrated / Measured Quantities / Frequency	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
12. Temperature Enclosure		
Lab In-House procedure UNI-T010 Rev:0	-80 °C – -40 °C	0.4 °C
	-40 °C – 50 °C	0.4 °C
	50 °C – 160 °C	0.4 °C
(Lab / Site)	160 °C – 200 °C	1.1 °C
	200 °C – 600 °C	2.6 °C
Freezers Oven & Furnaces	600 °C – 800 °C	2.6 °C
	800 °C – 1000 °C	3.7 °C

Approved Signatories

Mr Gavin Tan - For Electrical, A1 to A19

Mr Prabhakar Sundararaj - For Temperature, B5 to B8 and B10
For Electrical, all items in Cat A

Mr S.Karuppiah - For Temperature, all items in Cat B
For Electrical, all items in Cat A

Note :

This laboratory is accredited in accordance with the recognized 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 calibration results. 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.