

Laboratory	MMA Calabs Tech Ltd., 324, 3rd Floor, Chandralok Complex, III S.D. Road, Secunderabad, Hyderabad, Telangana		
Accreditation Standard	ISO/IEC 17025: 2005		
Discipline	Electro-Technical Calibration	Issue Date	26.11.2015
Certificate Number	C-1005	Valid Until	25.11.2017
Last Amended on	21.12.2015	Page	1 of 6

Quantity Measured / Instrument	Range/ Frequency	* Calibration Measurement Capability (\pm)	Remarks
I. SOURCE			
1. DC VOLTAGE \$	10 mV to 10 V	0.019% to 0.002 %	Using DMM Fluke 5520A by Direct Method
	10 V to 100 V	0.002 % to 0.004 %	
	100 V to 1000 V	0.004 % to 0.023 %	
DC VOLTAGE *	10 mV to 1 V	1.13% to 0.015 %	Using Transmille 1000 A by Direct Method
	1 V to 1000 V	0.02 %	
2. DC CURRENT \$	10 μ A to 329 μ A	0.24 %	Using DMM Fluke 5520A by Direct Method
	329 μ A to 3 mA	0.025 %	
	400 mA to 1 A	0.24 %	
DC CURRENT *	1 A to 10 A	0.24 % to 0.08 %	Using DMM Fluke 5520, with' Fluke Current Coil
	>10 A to 1000 A	0.85 % to 0.64 %	
DC CURRENT *	100 μ A to 10 μ A	0.21 to 0.11 %	Using Transmille 1000 A by Direct Method
	10 A to 100 A	0.65 % to 0.98 %	
	100 A to 500 A	0.98% to 0.61 %	
3. AC VOLTAGE \$	50 Hz to 1 kHz 3 mV to 1000 V	0.25 % to 0.04 %	Using Fluke 5520A by Direct Method
	1 kHz to 10 kHz 3 mV to 300 V	0.26 % to 0.05 %	
	10 kHz to 450 kHz 30 mV to 3 V	1.12 % to 0.24 %	
AC VOLTAGE *	1 kHz 10 mV to 700 V	0.28 % to 0.16 %	Using Transmille 1000 A by Direct Method
4. AC CURRENT \$	50 Hz to 1 kHz 100 μ A to 3mA	0.51 %	Using DMM Fluke 5520A by Direct Method
	400 mA to 10 A	0.07 % to 0.14 %	

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Quantity Measured / Instrument	Range/ Frequency	* Calibration Measurement Capability (\pm)	Remarks
AC CURRENT \$	1 kHz to 5 kHz 400 mA to 1 A	0.96 % to 3.44 %	Using DMM Fluke 5520A by Direct Method
	50 Hz 10 A to 1000 A	3.4 % to 0.64 %	Using DMM Fluke 5520, with' Fluke Current Coil
AC CURRENT *	1 kHz 100 μ A to 10 A	0.57 % to 0.35 %	Using Transmille 1000 A by Direct Method
	50 Hz 10 A to 100 A	0.35 % to 0.99 %	
	100 A to 500 A	0.99 % to 0.63 %	
5. DC RESISTANCE	2 Ω to 10 Ω 10 Ω to 100 M Ω	0.11 % to 0.018 % 0.018 % to 0.07 %	Using fluke, 5520 A by Direct Method
CAPACITANCE	1 kHz 1 nF to 1 μ F 1 nF to 100 μ F	0.67 % to 0.47 % 0.47 % to 0.67%	Using fluke, 5520 A by Direct Method
DC RESISTANCE *	0.01 Ω to 0.5 Ω 0.5 Ω to 100 k Ω	0.3 % to 0.8 % 0.8 % to 0.06 %	Using Decade Resistance Box 7400 Vaiseshika by Direct Method
DC RESISTANCE *	100 k Ω to 10 M Ω 100 M Ω to 1 G Ω	2.3 % 2.3% to 6.1 %	Using Decade MegOhm Box 8400 HV Vaiseshika by Direct Method
	1 G Ω to 2 T Ω	8 % to 6 %	Using Decade MegOhm Box 8400 HV Vaiseshika by Direct Method
DC SIMULATED RESISTANCE *	1 Ω to 10 Ω	2.01 % to 0.59 %	Using Decade Transmille 1000 A
	10 Ω to 100 Ω	0.59 % to 0.08 %	by Direct Method
	100 Ω to 100 k Ω	0.08 % to 0.024 %	
	100 k Ω to 10 M Ω	0.024 % to 1.05 %	

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INSULATION RESISTANCE * (100 V to 1000 V)	0.25 MΩ to 1MΩ 1 MΩ to 100 MΩ	3.4 % to 1.71 % 1.71 % to 1.1 %	Using Transmille 1000 A by Direct Method
6. FREQUENCY \$	50 Hz to 100 kHz	0.012 % to 0.006 %	Using Fluke 5520A by Direct Method
FREQUENCY *	50 Hz to 100 kHz	5.77 % to 0.006 %	Using Decade Transmille 1000 A by Direct Method
7. AC POWER \$ 1-Ø	50 Hz, 120 V to 240 V, 1 A to 20 A		
P.F.@UPF	42 W to 4.8 kW	1.51 % to 0.62 %	Using Fluke 5520A by Direct Method
P.F.@0.8	34 W to 3.84 kW	1.97 % to 6.02 %	
P.F.@0.5	21 W to 2.4 kW	2.92 % to 1.05 %	
P.F.@0.2	8.4 W to 0.96 kW	5.7 % to 1.24 %	
8. TEMPERATURE SIMULATION \$ Calibration of (Indicator/Recorder/Controller) Thermocouple			
K-Type	-190 °C to 1350 °C	0.5 °C	Using DMM Fluke 5520A by Direct Method
J-Type	- 190 °C to 1200 °C	0.8 °C	
R-Type	0 °C to 1300 °C	0.7 °C	
S-Type	0 °C to 1300 °C	0.7 °C	
N-Type	-190 °C to 1200 °C	0.9 °C	
E-Type	-190 °C to 1000 °C	0.6 °C	
RTD	-200 °C to 790 °C	0.2 °C to 0.3 °C	

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Quantity Measured / Instrument	Range/ Frequency	* Calibration Measurement Capability (\pm)	Remarks
9. TEMPERATURE SIMULATION *			
(Indicator/Recorder/ Controller)			
Thermocouple			
K-Type	-190 °C to 1200 °C	0.67 °C	Using Decade Transmille 1000 A with T/C Measuremetn adaptor EA001A by Direct Method
J-Type	- 190 °C to 1200 °C	1.0 °C	
R-Type	150 °C to 1300 °C	0.8 °C	
S-Type	150 °C to 1300 °C	1.1 °C	
N-Type	-190 °C to 1200 °C	1.1 °C	
E-Type	-190 °C to 1000 °C	0.94 °C	
TType	-100 °C to 400 °C	0.75 °C	
RTD	-200 °C to 790 °C	0.6 °C	Using Decade Transmille 1000 A by Direct Method
II. MEASURE			
1. DC VOLTAGE \$	10 mV to 10 V	0.05 % to 0.003 %	Using Fluke 8846 A by Direct Method
	10 V to 100 V	0.003 % to 0.005 %	
	100 V to 1000 V	0.005 % to 0.006 %	
2. DC CURRENT \$	100 μ A to 1 mA	0.09 % to 0.57 %	Using Fluke 8846 A by Direct Method
	1 mA to 1 A	0.57 % to 0.08 %	
	1 A to 10 A	0.08 % to 0.19 %	
3. AC VOLTAGE \$	50 Hz to 100 kHz 10 mV to 10 V	0.70 % to 0.13 %	Using Fluke 8846 A by Direct Method
	50 kHz to 1 kHz 10 mV to 1000 V	0.77 %	

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Quantity Measured / Instrument	Range/ Frequency	* Calibration Measurement Capability (±)	Remarks
4. AC CURRENT \$	50 Hz to 1 kHz 200 µA to 100 mA 100 mA to 1 A 1A to 10 A	0.88% to 0.38% 0.38% to 0.18% 0.18% to 0.35%	Using Fluke 8846 A by Direct Method
5. DC RESISTANCE \$	1 Ω to 100 Ω 100 Ω to 1MΩ 1 MΩ to 100 MΩ	0.35 % to 0.02 % 0.02 % to 0.01 % 0.01 % to 0.91 %	Using Fluke 8846 A by Direct Method
6. FREQUENCY \$ TEMP. SIMULATION	50 Hz to 100 kHz	0.06 %	Using Fluke 8846 A by Direct Method
7. THERMOCOUPLE \$			
K-Type	-190 °C to 1350 °C	0.8 °C	Using Fluke, 5520 A, by Direct Method
J-Type	-190 °C to 1200 °C	0.8 °C	
R-Type	0 °C to 1300 °C	1.0 °C	
S-Type	0 °C to 1300 °C	1.0 °C	
N-Type	-190 °C to 1200 °C	0.9 °C	
E-Type	-190 °C to 1000 °C	0.9 °C	
RTD	-190 °C to 800 °C	0.7 °C	
8. TEMPERATURE SIMULATION * (Indicator/Recorder/Controller)			
Thermocouple			Using 1000A with T/C Measurement adaptor EA001 by Direct Method
K-Type	-190 °C to 1200 °C	0.6 °C	
J-Type	-190 °C to 1200 °C	0.7 °C	
R-Type	150 °C to 1300 °C	0.7 °C	
S-Type	150 °C to 1300 °C	1.0 °C	
N-Type	0 °C to 1200 °C	1.2 °C	
E-Type	-100 °C to 1000 °C	0.9 °C	
T-Type	-100 °C to 400 °C	0.7 °C	

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9. Time *	60 s to 360 s 360 s to 7200 s	5.88 % 5.78 %	Using Stop Water Extech 365510 by Comparison Method

* Measurement Capability is expressed as an uncertainty (\pm) at a confidence probability of 95%

*Only in Permanent Laboratory

*Only for Site Calibration

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