

Laboratory Calsytech, # 38 North Mada Street Nandambakkam, Chennai, Tamil Nadu

Accreditation Standard ISO/IEC 17025:2005

Discipline Electro-Technical Calibration **Issue Date** 29.09.2016

Certificate Number C-0294 **Valid Until** 28.09.2018

Last Amended on 23.11.2016 **Page** 1 of 7

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>SOURCE</u>			
1. DC VOLTAGE [§]	1mV to 10 mV	0.43% to 0.05%	Using Multifunction Calibrator, Calibrator by Direct Method
	10 mV to 100 mV	0.05% to 0.01%	
	100 mV to 1000 V	0.01% to 0.004%	
DC VOLTAGE [*]	1mV to 20 mV	0.46% to 0.04%	
	20 mV to 200 mV	0.04% to 0.008%	
	200 mV to 1000 V	0.008%	
2. AC VOLTAGE [§]	40 Hz to 1 kHz		Using Multifunction Calibrator, Calibrator By Direct Method
	10 mV to 1V	0.6% to 0.1%	
	1V to 1000V	0.1% to 0.07%	
	1 kHz to 10 kHz		Using Multifunction Calibrator, Calibrator By Direct Method
	10 mV to 10 V	1.28% to 0.2%	
	10 V to 700 V	0.2% to 0.34%	
AC VOLTAGE [*]	50 Hz to 1 kHz		
	20 mV to 200 V	0.2 % to 0.05 %	
	200 V to 1000 V	0.05 %	
3. DC CURRENT [§]	1 μ A to 10 μ A	2.34% to 0.24%	Using Multifunction Calibrator, Calibrator By Direct Method
	10 μ A to 100 μ A	0.24% to 0.34%	
	100 μ A to 1 A	0.34% to 0.02%	
	1 A to 20 A	0.02% to 0.05%	
	20 A to 1000 A	0.77% to 0.36%	With Current Coil

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4. AC CURRENT ^{\$}	40 Hz to 1 kHz 20 μ A to 100 μ A 100 μ A to 1 A 1 A to 20 A	4% to 0.88% 0.88% to 0.13% 0.13%	Using Multifunction Calibrator, Calibrator 2041 A By Direct Method
	50 Hz to 60 Hz 20 A to 1000 A	0.77% to 0.32%	Using Current Coil
AC CURRENT [*]	50 Hz to 1 kHz 25 μ A to 20 mA 20 mA to 2 A 2 A to 20 A	1.4 % to 0.5 % 0.5 % to 0.1 % 0.1 %	
	50 Hz 20 A to 1000 A	0.80 % to 0.3 %	Using Current Coil
5. FREQUENCY ^{\$}	45 Hz to 10 MHz 10 MHz to 600 MHz	0.004% 0.004%	Using Multifunction Calibrator, Calibrator 2041 A By Direct Method
	FREQUENCY [*]	100 Hz to 10 MHz 10 MHz to 250 MHz	0.002 % to 0.0023 % 0.0023 % to 0.004 %
6. CAPACITANCE [#]	1 kHz 1nF to 100 μ F	0.4% to 1%	Using Multifunction Calibrator, Calibrator 2041 A By Direct Method
7. AC RESISTANCE [#]	1 kHz 100 Ω 1 k Ω 10 k Ω	0.07% 0.07% 0.07%	Using Standard Resistor by Direct Method

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8. DC RESISTANCE [#] 4Wire/2Wire	100 $\mu\Omega$	0.46%	Using Standard Resistor By Direct Method Using Multifunction Calibrator, Calibrator By Direct Method
	1 m Ω	0.46%	
	10 m Ω	0.46 %	
	100 m Ω to 1 Ω	0.15% to 0.1 3%	
	1 Ω to 1 k Ω	0.13% to 0.005%	
	1 k Ω to 1 M Ω	0.005% to 0.012%	
	1 M Ω to 1 G Ω	0.012% to 1.2%	
9. OSCILLOSCOPPE [#] Amplitude	5 kV 1 G Ω to 100 G Ω	1.2% to 6.2%	Using Multifunction Calibrator, Calibrator 2041 A By Direct Method
	12 mV to 120 V 2 mV /Div to 20 V/Div	0.082 % to 0.013 %	
	Time Base Bandwidth 2 ns to 5 s 50 kHz 10 MHz to 600 MHz	0.03 % to 0.012 % 1.3 dB	
10. DC POWER [#]	10 V to 600 V 1 A to 20 A 10 W to 12 kW	0.038 % to 0.076 %	Using Multifunction Calibrator, Calibrator 2041 A By Direct Method
11. PHASE ANGLE [#]	50 Hz 0° to 330°	0.3°	Using Multifunction Calibrator, Calibrator 2041 A By Direct Method
12. INDUCTANCE [#]	1 kHz 1 mH to 10 H	0.58 % to 0.59 %	Using Inductance Box By Direct Method

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13. TEMPERATURE SUMULATION[#]			
RTD	(-) 100 °C to 800 °C	0.15 °C	
K & J Type Thermocouple	(-)180 °C to 1250 °C	0.42 °C	Using Multifunction calibrator by Direct Method
B Type Thermocouple	0 °C to 1800 °C	1.5 °C	
E Type Thermocouple	0 °C to 1800 °C	2 °C	
N Type Thermocouple	(-) 200 °C to 1300 °C	0.5 °C	
R&S Type Thermocouple	0 °C to 1700 °C	1.17 °C	
T Type Thermocouple	(-) 200 °C to 400 °C	0.26 °C	
14. ENERGY^s @ 50 Hz 1ϕ and 3 ϕ (0.5 PF to UPF)	63.5 V to 300 V 1A to 15 A	0.25 %	Using Energy Calibration Source by Direct Method
15. AC POWER^s @ 50 Hz 1ϕ and 3 ϕ (0.5 PF to UPF)	110V to 300 V 1A to 20A 110 W to 6000W	0.25 %	Using Energy Calibration Source Educetech by Direct Method
	300 V A to 600V 1A to 20A 6000W to 12000W	0.25 %	
	110 W to 6000 W 110 V to 300 V 1A to 20A	0.25 %	
AC POWER[*] @ 50 Hz 1ϕ UPF	10 W to 12 kW 10 V to 600 V 1A to 20A	0.35 % to 1.2 %	Using Power Energy Calibrtor by Direct Method

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<u>MEASURE</u>			
1. DC VOLTAGE[#]	1 mV to 100 mV	0.054 % to 0.008 %	Using Digital Multimeter 8½ By Direct Method
	100 mV to 1000 V	0.008 % to 0.002 %	
	100 mV to 1000 V	0.007 % to 0.001 %	Using Digital Multimeter 8½ With Calibrator By Comparison Method
DC HIGH VOLTAGE[#]	1 kV to 35 kV	2.7 %	Using Hv Probe With Digital Multimeter By Direct Method
2. AC VOLTAGE[#]	50 Hz to 1 kHz		Using Digital Multimeter 8½ By Direct Method
	20 mV to 100 V	0.2 % to 0.040 %	
	100 V to 1000 V	0.040 % to 0.051 %	
	100 mV to 750 V	0.16 % to 0.052%	
	50 Hz		Using Digital Multimeter 8½ With Calibrator By Comparison Method
	2 kV to 18 kV	6 %	
	1 kHz to 10 kHz		Using Digital Multimeter 8½ With Calibrator by Comparison Method
	100 mV to 700 V	0.060 %	
3. DC CURRENT[#]	1 μ A to 10 μ A	0.03 % to 0.05 %	Using Digital Multimeter 8½ By Direct Method
	10 μ A to 100 μ A	0.05 % to 0.002 %	
	100 μ A to 100 mA	0.002 % to 0.004 %	
	100 mA to 1A	0.004 % to 0.02 %	
	1 A to 20 A	0.02 % to 0.09 %	
	100 mA to 3 A	0.007 % to 0.05 %	Using Digital Multimeter 8½ With Calibrator by Comparison Method

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	20 A to 100 A	0.68 %	Using Precision Shunt With Digital Multimeter By Direct Method
4. AC CURRENT^{\$}	40 Hz to 1 kHz 20 μ A to 1 A 1 A to 20 A	0.15 % to 0.058 % 0.058 % to 0.15 %	Using Digital Multimeter 8½ By Direct Method
	50 Hz 100 mA to 3 A	0.1% to 0.25 %	Using Digital Multimeter 8½ With Calibrator By Comparison Method
	20 A to 100 A	0.93 %	Using Precision Shunt With Digital Multimeter By Direct Method
5. DC RESISTANCE[#]	1 Ω to 100 Ω 100 Ω to 1 M Ω 1M Ω to 100 M Ω 100 M Ω to 100 G Ω	0.003 % to 0.0012 % 0.0012 % to 0.0016 % 0.0016 % to 0.015 % 0.05 % to 0.5%	Using Digital Multimeter 8½ By Direct Method
	10 Ω to 100 Ω 100 Ω to 10 k Ω 10 k Ω to 10 M Ω	0.023% to 0.0027% 0.0027% to 0.004% 0.004% to 0.034%	Using Digital Multimeter 8½ With Calibrator By Comparison Method
6. TIMER^{\$}	10 s to 1000 s	0.18%	Using Timer By Direct Method

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7. TEMPERATURE SIMULATION[#]			
K Type Thermocouple	(-) 180 °C to 1200 °C	0.51 °C	Using Digital Multimeter 8½ By Direct Method
J Type Thermocouple	(-) 140 °C to 1340 °C	0.61 °C	
B Type Thermocouple	300 °C to 1800 °C	0.52 °C	
E Type Thermocouple	0 °C to 800 °C	0.31 °C	
N Type Thermocouple	(-) 180 °C to 1300 °C	0.32 °C	
R Type Thermocouple	0 °C to 1700 °C	1.2 °C	
S Type Thermocouple	0 °C to 1700 °C	0.58 °C	
T Type Thermocouple	0 °C to 400 °C	0.41 °C	
RTD	(-) 100 °C to 800 °C	0.02 °C	
8. AC POWER ^{\$}	75 V		Using Digital Power Meter by Direct Method
@ 50 Hz , UPF 1 ϕ	1 A to 600 V 75 W to 12 kW	0.42 % to 0.31 %	
9. FREQUENCY^{\$}	0.02 kHz to 200000 kHz	0.71 % to 0.004 %	Using Universal Counter by Direct Method

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

^{\$} Only in Permanent Laboratory

^{*} Only for Site Calibration

[#] The laboratory is also capable for site calibration however, the uncertainty at site depends on the prevailing actual environmental conditions and master equipment used.

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