

Laboratory **Electronics Test & Development Centre, STQC DTE, DeitY, Govt. of India, North Kamala Nagar, ECIL (PO), Hyderabad, Telangana**

Accreditation Standard **ISO/IEC 17025:2005**

Discipline **Electro-Technical Calibration** **Issue Date** **19.08.2014**

Certificate Number **C-0023** **Valid Until** **18.08.2016**

Last Amended on - **Page** **1 of 9**

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
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SOURCE

1. DC Voltage[§]	100 uV to 10 mV	0.57 % to 0.0065 %	Using MFC's 4808, Wavetek 5720 Fluke by Direct Method
	10 mV to 100 mV	0.0065 % to 0.0014 %	
	100 mV to 1000 V	0.0014 % to 0.0009 %	
DC Voltage[△]	1 mV to 10 mV	0.5 % to 0.054 %	Using MFC's Fluke 5520A & 9100 by Direct Method
	10 mV to 100 mV	0.054 %	
	100 mV to 1000 V	0.054 % to 0.004 %	
2. DC Current[§]	100 uA to 100 mA	0.014 % to 0.006 %	Using MFC's 4808, Wavetek 5720, Fluke & 5725A Amplifier by Direct Method
	100 mA to 1 A	0.006 % to 0.014 %	
	1 A to 10 A	0.014 % to 0.04 %	
	10 A to 100 A	0.26 %	
	10 A to 1000 A	0.45 %	
DC Current[△]	100 uA to 100 mA	0.014 % to 0.015 %	Using MFC's Fluke 5520A & 9100 by Direct Method
	100 mA to 1 A	0.015 % to 0.032 %	
	1 A to 20 A	0.032 % to 0.15 %	
3. DC Resistance[§]	1 mΩ to 10 Ω	0.13 % to 0.004 %	Using Std. Resistors GR1440, IET SRX & 9409A by Direct Method (Discrete Values)
	10 Ω to 100 kΩ	0.004 % to 0.002 %	
	100 kΩ to 100 MΩ	0.002 % to 0.016 %	
	100 MΩ to 2 GΩ	0.016 % to 0.08 %	

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Last Amended on - **Page** **2 of 9**

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
DC Resistance*	1 mΩ to 100 mΩ	0.1 %	Using Std. Resistors 1440Series MFCs 5520A & 9100 Fluke by Direct Method (Discreet Values)
	100 mΩ to 10 Ω	0.02 % to 0.009 %	
	10 Ω to 100 Ω	0.009 % to 0.0035 %	
	100 Ω to 100 kΩ	0.0035 % to 0.0025 %	
	100 kΩ to 2 MΩ	0.0025 % to 0.05 %	
	2 MΩ to 20 MΩ	0.05 % to 0.06 %	
	20 MΩ to 200 MΩ	0.06 % to 0.5 %	
4. DC High Resistance[§] (5kV Rating)	10 MΩ to 100 MΩ	0.05 %	Using Std. Resistors IET, SRC, SR Series by Direct Method (Discrete Values)
	100 MΩ to 1 GΩ	0.05 % to 0.18 %	
	1 GΩ to 1 TΩ	0.18 % to 3.0 %	
DC High Resistance* (1kV Rating)	0.1 MΩ to 1.0 GΩ	2.0 %	Using HSMDRB 8400 Vaiseshika by Direct Method
5. AC Voltage[§]	10 Hz to 20 kHz		Using MFC's 4808 Wavetek 5720, 5520A Fluke by Direct Method
	1m V to 100 mV	0.4 % to 0.02 %	
	100 mV to 100 V	0.02 % to 0.05 %	
	100 V to 1000 V	0.05 % to 0.025 %	
	10 kHz to 100 kHz		
	1 mV to 100 mV	0.2 % to 0.05 %	
100 mV to 100 V	0.05 % to 0.11 %		
AC Voltage*	10 Hz to 10 kHz		Using MFC's Fluke 5520A & 9100 by Direct Method
	1 mV to 100 mV	0.7 % to 0.05 %	
	100 mV to 1000 V	0.05 % to 0.06 %	

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Last Amended on - **Page** **3 of 9**

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
AC Voltage*	10 kHz to 100 kHz 100 mV to 100 V	0.1 % to 0.5 %	Using MFC's Fluke 5520A& 9100 by Direct Method
6. AC Current [§]	10 Hz to 5 kHz 100 uA to 100 mA 100 mA to 1 A 1 A to 10 A	0.07 % to 0.03 % 0.03 % to 0.07 % 0.07 % to 0.04 %	Using MFC's 4808,Wavetek 5720, Fluke by Direct Method
AC Current*	50 Hz to 1 kHz 10 mA to 2 A 2 A to 20 A	0.1 % to 0.15 % 0.15 % to 0.2 %	Using MFC's Fluke 5520A& 9100 by Direct Method
7. AC High Current [§]	50 Hz 10 A to 100 A	0.28 %	Using Meatest,M150S by V/I Method
	100 A to 1000 A	0.6 %	Using Fluke 5520 & 9100 with turn current coil
8. Frequency [§]	10 Hz to 2.0 GHz	10 ppm to 0.13 ppm	Using Signal Generator SMX, R&S Fluke, 5820A by Direct Method
Frequency*	10 Hz to 100 kHz	115 ppm to 10 ppm	Using MFC's Fluke 5520A& 9100 by Direct Method

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Last Amended on - **Page** 4 of 9

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (\pm)	Remarks
9. AC Active & Reactive Power & Energy [§] (3 \emptyset)	40 Hz to 70 Hz Power:252 kW 40 V to 300 V 10 mA to 120 A PF:0.5 to UPF	0.05 % to 0.03 %	Using Calstat -400 & Phanmtom Load HEG/EDI/MTE by Direct Method
AC Active & Reactive Power & Energy [*] (3 \emptyset)	50 Hz Power:252 kW 40 V to 300 V 10 mA to 120 A PF:0.5 to UPF	0.05 % to 0.03 %	Using Calstat -400 & Phanmtom Load HEG/EDI/ MTE by Direct Method
10. Amplitude/ Frequency Modulation [§]	AM:30 % to 80 % FM:10 kHz to 200 kHz (fc:100 MHz to 1 GHz fm:1 kHz)	2 % to 5 % 10 %	Using Signal Generator SMX, R&S by Direct Method
11. RF Level [§]	(-)50d Bm to (+)13 dBm (10 MHz to 1 GHz)	1.8 dB	Using Signal Generator SMX, R&S by Direct Method
12. Capacitance [§]	1kHz 100 pF to 10 nF 10 nF to 1 uF 1 uF to 100 uF	0.15 % 0.065 % 0.40 %	Using Std. Capacitors IET,SCA Series) by Direct Method
13. Inductance [§]	1kHz 0.1 mH to 1 H 1 H to 10 H	0.3 % to 0.12 % 0.12 % to 0.95 %	Using Std. Inductor GR 1482 by Direct Method

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Last Amended on **-** **Page** **5 of 9**

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14. Oscilloscope# Bandwidth Amplitude Time Base	50 kHz to 600 MHz 1 mV to 130 Vpk-pk 1 ns to 5 s	5.1 % 0.2 % to 0.12 % 1700 ppm to 130 ppm	Using Oscilloscope Calibrator Fluke 5820A,9100 by Direct Method
15. Temperature Simulation# (Indicator/Controller/Recorder)			
a. Thermocouple Type			
J Type K Type R Type S Type T Type	-200°C to 1750°C	0.05°C	Using MFC 4808 Wavetek
b. RTD Type	-200°C to 850°C	0.02°C to 0.04°C	Using Precision RTD Simulator, Meatest , M 612
16. AC/DC Shunt Calibration [§]	10 A to 100 A	0.26 %	Using Tinsley 4638F & Meatest, Motwane M150S by Direct Method
<u>MEASURE</u>			
17. DC Voltage#	100 uV to 10 mV 10 mV to 100 mV 100 mV to 1000 V	0.54 % to 0.0042 % 0.0042 % to 0.0005 % 0.0005 % to 0.0011 %	Using DMM, Fluke 8508A / Agilent 34401A by Direct/Comparison Method

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Last Amended on **-** **Page** **6 of 9**

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
DC Voltage [#]	1 kV to 20 kV	2.8 %	Using Fluke 287 & HV Probe 80k40/80k6 by Direct/Comparison Method
18. DC Current ^{\$}	100 uA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 10 A	12 ppm to 14 ppm 14 ppm to 50 ppm 50 ppm to 210 ppm 210 ppm to 480 ppm	Using DMM Fluke 8508A by Direct/Comparison Method
DC Current [*]	10 mA to 100 mA 100 mA to 3 A	0.08 % 0.08 % to 0.16 %	Using DMM Agilent 34401A by Direct Method
19. DC Resistance ^{\$}	1 mΩ to 10 Ω 10 Ω to 100 kΩ 100 kΩ to 100 MΩ 100 MΩ to 2 GΩ	0.36 % to 0.0012 % 0.0012 % to 0.002 % 0.002 % to 0.017 % 0.017 % to 0.18 %	Using DMM Fluke 8508A by Direct/Comparison Method
DC Resistance [*]	1 mΩ to 100 mΩ 100 mΩ to 10 Ω 10 Ω to 100Ω 100 Ω to 100 kΩ 100 kΩ to 2 MΩ 2MΩ to 20 MΩ 20 MΩ to 200 MΩ	0.1 % 0.02 % to 0.009 % 0.009 % to 0.0035 % 0.0035 % to 0.0025 % 0.0025 % to 0.05 % 0.05 % to 0.02 % 0.02 % to 0.05 %	Using Std. Resistors 1440Series MFCs 5520A & 9100 Fluke by V/I & Direct Method (Discreet Values)
20. DC High Resistance [*] (1kV Rating)	0.1 MΩ to 1.0 GΩ	2.0 %	Using HSMDRB 8400 Vaiseshika by Direct Method

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Last Amended on **-** **Page** **7 of 9**

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21. AC Voltage[§]	10 Hz to 10 kHz		
	1 mV to 100 mV	0.4 % to 0.016 %	Using DMM, Fluke 8508A by Direct/Comparison Method
	100 mV to 100 V	0.016 % to 0.018 %	
	100 V to 1000 V	0.018 % to 0.026 %	
	10 kHz to 100 kHz		
	1 mV to 100 mV	0.7 % to 0.43 %	Using DMM, Fluke 8508A by Direct/Comparison Method
100 mV to 100 V	0.43 % to 0.1 %		
AC Voltage[*]	10 Hz to 10 kHz		
	10 mV to 100 mV	0.13 % to 0.05 %	Using Agilent 34401A by Direct Method
	100 mV to 1000 V	0.05 % to 0.11 %	
	10 kHz to 100 kHz		
	100 mV to 100 V	0.11 % to 0.8 %	
22. AC High Voltage[#]	50 Hz		
	1 kV to 20 kV	6.2 %	Using Fluke 287 & HV Probe 80k40/80k6 by Direct/Comparison Method
23. AC Current[§]	10 Hz to 5 kHz		
	100 uA to 100 mA	0.06 %	Using DMM, Fluke 8508A by Direct Method
	100 mA to 1 A	0.06 % to 0.1 %	
	1 A to 10 A	0.1 %	
AC Current[*]	10 Hz to 5 kHz		
	1 A to 3 A	0.17 % to 0.25 %	Using Agilent 34401A by Direct Method

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Last Amended on - **Page** **8 of 9**

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24. Frequency [§]	10 Hz to 2.0 GHz	12 ppm to 0.13 ppm	Using Microwave Frequency Counter 5350B HP by Direct Method
Frequency [*]	10 Hz to 100 kHz	151 ppm	Using Agilent 34401A by Direct Method
25. AC Active & Reactive Power & Energy [§] (3 \emptyset)	40 Hz to 70 Hz Power:187.2 kW 40 V to 300 V 10 mA to 120 A PF:0.5 to UPF & ZPF	0.05 % to 0.03 %	Using Calstat -400 & Phanmtom Load HEG/EDI/ MTE by Direct Method
AC Active & Reactive Power & Energy [*] (3 \emptyset)	40 Hz to 70 Hz Power:252 kW 40 V to 300 V 10 mA to 120 A PF:0.5 to UPF	0.05 % to 0.03 %	Using Calstat -400 & Phanmtom Load HEG/EDI/ MTE by Direct Method
26. Amplitude/ Frequency Modulation [§]	AM:30 % to 80 % FM:10 kHz to 200 kHz (fc:100 MHz to 1 GHz fm:1 kHz)	1 % to 3 % 3 % to 5 %	Using Modulation Analyser HP, 8901B by Direct Method
27. RF Level [§]	-50d Bm to +13 dBm (10 MHz to 1 GHz)	0.2 dB	Using RF Power Meter ,NRP R&S by Direct Method

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Last Amended on - **Page** 9 of 9

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (\pm)	Remarks
28. Temperature Simulation [#] (Indicator/Controller/Recorder)			
a. Thermocouple Type			
J Type K Type R Type S Type T Type	-200 °C to 1750 °C	0.05 °C	Using 741B, Fluke & DMM 8508A Fluke
b. RTD Type	-200 °C to 850 °C	0.02 °C to 0.04 °C	Using 741B, Fluke & DMM 8508A Fluke
29. AC/DC Shunt Calibration ^{\$}	10 A to 100 A	0.30 %	Using Tinsley 4638F & Meatest, Motwane M150S by Direct/Comparison 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.