

Laboratory Standards Laboratory (ELE), Bharat Dynamics Limited, Milan Division, Hyderabad, Telangana

Accreditation Standard ISO/IEC 17025: 2005

Discipline Electro-Technical Calibration **Issue Date** 23.08.2015

Certificate Number C-0077 **Valid Until** 22.08.2017

Last Amended on 11.09.2015 **Page** 1 of 6

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (\pm)	Remarks
I. SOURCE			
1. DC Voltage ^{\$}	1 mV to 10 mV	0.080 % to 0.010 %	Using Multifunction Calibrator by Direct method
	10 mV to 100 mV	0.010 % to 0.0025 %	
	100 mV to 1 V	0.0025 % to 0.0012%	
	1 V to 1000 V	0.0012 % to 0.0017%	
2. DC Current ^{\$}	1 μ A to 10 μ A	1.53 % to 0.16 %	Using Multifunction Calibrator by Direct method
	10 μ A to 100 μ A	0.16 % to 0.027 %	
	100 μ A to 1 A	0.027 % to 0.018 %	
	1 A to 10 A	0.018 % to 0.042 %	
	10 A to 20 A	0.042 % to 0.079 %	
3. AC Voltage ^{\$}	10 Hz to 10 kHz		Using Multifunction Calibrator by Direct method
	1 mV to 30 mV	0.54 % to 0.086 %	
	30 mV to 30 V	0.086 % to 0.034 %	
	45 Hz to 10 kHz		
	30 V to 1000 V	0.026 %	
	10 kHz to 100 kHz		
	1 mV to 30 mV	1.34 % to 0.31 %	
	30 mV to 30 V	0.31 % to 0.074 %	
	30 V to 300 V	0.074 % to 0.17 %	
	100 kHz to 450 kHz		
30 mV to 3 V	0.76 % to 0.21 %		
4. AC Current ^{\$}	45 Hz to 1 kHz		Using Multifunction Calibrator by Direct method
	30 μ A to 1 mA	0.38 % to 0.11 %	
	1 mA to 20 A	0.11 % to 0.15 %	

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5. Resistance ^{\$}	1 M Ω	0.032 %	Using Standard Resistors by Direct method
	10 M Ω	0.012 %	
	100 M Ω	0.006 %	
	1 Ω to 100 Ω	0.081 % to 0.014 %	Using Multifunction Calibrator by Direct method
	100 Ω to 1 M Ω	0.014 % to 0.0036 %	
	1 M Ω to 10 M Ω	0.0036 % to 0.012 %	
10 M Ω to 100 M Ω	0.012 % to 0.040 %		
100 M Ω to 300 M Ω	0.040 % to 0.25 %		
6. Frequency ^{\$}	500 M Ω	0.13 %	Using High Voltage Resistors by Direct method
	1 G Ω	1.13 %	
	5 G Ω	1.2 %	
	10 G Ω	1.4 %	
	1 Hz to 100 MHz	1.3 ppm	
7. Inductance ^{\$}	@1 kHz 1 mH to 10 H	0.58 % to 2.31 %	Using Inductance box by Direct method
8. Capacitance ^{\$}	@ 1 kHz 10 pF to 100 pF	5.83 % to 0.64 %	Using Capacitance Box by Direct method
	100 pF to 1 μ F	0.64 % to 0.063 %	
	@100 Hz 1 μ F to 100 μ F	0.27 % to 0.44 %	Using Multifunction by Direct method

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9. TEMPERATURE SIMULATION \$ (Indicator/ Recorder/ Controller)			
Thermocouple			
K-Type	(-)200 °C to 1350 °C	0.32 °C	Using Multifunction Calibrator by Direct method
J -Type	(-)200 °C to 1200 °C	0.27 °C	
T- Type	(-)250 °C to 400 °C	0.5 °C to 0.21 °C	
RTD (Pt 100)	(-)199 °C to 800 °C	0.11 °C to 0.21 °C	
10. OSCILLOSCOPE CALIBRATION \$			
Amplitude (DC Signal)	1 mV to 50 mV 50 mV to 500 mV 500 mV to 220 V	2.92 % to 0.087 % 0.087 % to 0.035 % 0.035 % to 0.028 %	Using Oscilloscope Calibrator by Direct method
Sine Wave Signal (50 Ω)	45 Hz to 50 kHz 30 mV to 3 V	1.74 %	
Square Wave Signal (1 MΩ)	@ 1 kHz 6 mV to 60 mV 60 mV to 60 V	0.41 % to 0.12 % 0.12 % to 0.061 %	
Flatness (Bandwidth)	(Reference @ 50 kHz) 50 kHz to 1 GHz	2.5 % to 5 %	
Time Marker	460 ps to 50 s	17 ppm	

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II. MEASURE			
1. DC Voltage \$	10 μ V to 100 μ V 100 μ V to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 1000 V	1.13 % to 0.10 % 0.10 % to 107 ppm 107 ppm to 15 ppm 15 ppm to 7 ppm 7 ppm to 7.4 ppm	Using Digital Multimeter by Direct Method
2. DC Current \$	1 μ A to 10 μ A 10 μ A to 100 μ A 100 μ A to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 20 A	0.044 % to 61 ppm 61 ppm to 11 ppm 11 ppm to 24 ppm 24 ppm to 49 ppm 49 ppm to 192 ppm 0.019 % to 0.043 %	Using Digital Multimeter by Direct Method
3. AC Voltage \$	20 Hz to 10 kHz 1 mV to 10 mV 10 mV to 100 mV 100 mV to 100 V 55 Hz to 10 kHz 100 V to 1000 V 10 kHz to 100 kHz 10 mV to 100 mV 100 mV to 100 V 10 kHz to 20 kHz 500 V	0.42 % to 0.053 % 0.053 % to 0.018 % 0.018 % to 0.015 % 0.015 % to 0.018 % 0.27 % to 0.091 % 0.091 % to 0.072 % 0.015 % to 0.029 %	Using Digital Multimeter by Direct Method

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4. AC Current ^{\$}	45 Hz to 1 kHz 100 μ A to 100 mA 100 mA to 1 A 1A to 20A	0.048 % 0.048 % to 0.083 % 0.083 % to 0.1 %	Using Digital Multimeter by Direct Method
	1 kHz to 10 kHz 10 mA to 1A	0.046 % to 0.092 %	
5. Resistance ^{\$} (2 W, 4 W)	0.001 Ω to 0.01 Ω	0.4 % to 0.041 %	Using Digital Multimeter by Direct Method
	0.01 Ω to 0.1 Ω	0.041 % to 0.0057 %	
	0.1 Ω to 1 Ω	57 ppm to 15ppm	
	1 Ω to 10 Ω	15 ppm to 9 ppm	
	10 Ω to 1 M Ω	9 ppm to 13 ppm	
	1 M Ω to 10 M Ω	13 ppm to 23 ppm	
	10 M Ω to 100 M Ω	23 ppm to 160 ppm	
	100 M Ω to 1 G Ω 1 G Ω to 10 G Ω	0.016 % to 0.032 % 0.032 % to 0.27 %	
6. Frequency/ Period ^{\$}	1 Hz to 3GHz 1 s to 3 ns	0.09 ppm to 0.025 ppm 0.09 ppm to 0.025 ppm	Using Universal Counter by Direct Method
7. Inductance ^{\$}	@1 kHz 1 mH to 10 H	0.28 % to 0.17 %	Using LCR Meter, by Direct Method
8. Capacitance ^{\$}	@ 1 kHz 10 pF to 100 pF 100 pF to 0.1 μ F 0.1 μ F to 1 μ F	1.2 % to 0.23 % 0.23 % to 0.12 % 0.12 %	Using LCR Meter, by Direct Method
	@ 100 Hz 10 μ F to 100 μ F	0.65 %	

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9. RF Power \$ (50 Ω)	50 MHz to 1 GHz -40 dBm to +13 dBm (100 nW to 20 mW)	7.1 % to 6.6 %	Using RF Power Meter With sensor by Direct Method

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

\$Only in Permanent Laboratory

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