Laboratory	**Roots Metrology & Testing Laboratory (A Unit of Roots Industries India Limited) RKG Industrial Estate, Ganapathy, Coimbatore, Tamil Nadu**		
Accreditation Standard	**ISO/IEC 17025:2005**		
Discipline	**Electro-Technical Calibration**	**Issue Date**	**26.06.2014**
Certificate Number	**C-0826**	**Valid Until**	**25.06.2016**
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Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
SOURCE			
1. DC Voltage$	10 mV to 100 mV	0.03 % to 0.004 %	Using Muti-product calibrator Make : Transmille Model : 3010 A by Direct Method
	100 mV to 1 V	0.004 % to 0.0015 %	
	1 V to 10 V	0.0015 % to 0.0012 %	
	10 V to 100 V	0.0012 % to 0.0018 %	
	100 V to 990 V	0.0018 % to 0.0017 %	
2. AC Voltage$	**40 Hz to 10kHz**		
	20 mV to 100 mV	0.32 % to 0.12 %	Using Muti-product calibrator Make : Transmille Model : 3010 A by Direct Method
	100 mV to 1 V	0.12 % to 0.082 %	
	1V to 10 V	0.082 % to 0.080 %	
	10 V to 700 V	0.080 % to 0.058 %	
	56Hz		
	700 V to 990 V	0.058 % to 0.045 %	
3. DC Current$	10 µA to 100 µA	0.13 % to 0.03 %	Using Muti-product calibrator Make : Transmille Model : 3010 A by Direct Method
	100 µA to 1 mA	0.02 % to 0.01 %	
	1 mA to 100 mA	0.01%	
	100 mA to1 A	0.01 % to 0.02 %	
	1 A to 10 A	0.02 % to 0.06 %	
	10 A to 1500 A	0.06 % to 0.08 %	Using Current Coil
4. AC Current$	**40 Hz to 1 kHz**		
	25 µA to 100 µA	3.12 % to 1.21 %	Using Muti-product calibrator Make : Transmille Model : 3010 A by Direct Method
	100 µA to 1 mA	1.21 % to 0.61 %	
	1 mA to 100 mA	0.61 % to 0.62 %	
	100 mA to 2A	0.62 % to 0.63 %	

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	Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
		56Hz		Using Current Coil
		1 A to 30 A	0.63 % to 0.36 %	
		30 A to 1500 A	0.36 % to 0.35 %	
5.	**Resistance$**	1 Ω to 10 Ω	1.42 % to 0.61 %	Using Muti-product calibrator Make : Transmille Model : 3010 A by Direct Method
		10 Ω to 100 Ω	0.61 % to 0.01 %	
		100 Ω to 1 kΩ	0.01 % to 0.003 %	
		1 kΩ to 10 kΩ	0.003 % to 0.0015 %	
		10 kΩ to 100 kΩ	0.0015 % to 0.0028 %	
		100 kΩ to 1 MΩ	0.0028 % to 0.0037 %	
		1 MΩ to 10 MΩ	0.0037 % to 0.012 %	
		10 MΩ to 100 MΩ	0.012 % to 0.21 %	
		1 MΩ to 1000 MΩ	2 % to 2.39 %	Using High Stability Decade Meg ohm box Make : Vaiseshika Model : 8400 HV by Direct Method
		10mΩ to 100mΩ	2.65 % to 0.58 %	Using High Precision Decade Resistance Box Make : Vaiseshika Model : 7400 by Direct Method
		100mΩ to 1Ω	0.58 % to 0.59 %	
6.	**Capacitance$**	**1 kHz**		
		1 nF to 10 nF	0.79 % to 0.32 %	Using Muti-product calibrator Make : Transmille Model : 3010 A by Direct Method
		10 nF to 100 nF	0.32 % to 0.30 %	
		100 nF to 1 µF	0.30 % to 0.47 %	
		1 µF to 10µF	0.47 % to 0.69 %	
		10 µF to 100µF	0.69 % to 0.70 %	
		100 µF to 1 mF	0.70 % to 1.2 %	
		1 mF to 10 mF	1.20%	

	Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
7.	**Inductance$**	**1 kHz**		
		1 mH to 10 mH	0.94 % to 0.70 %	Using Mutiproduct calibrator Make : Transmille Model : 3010 A by Direct Method
		10 mH to 100 mH	0.70%	
		100 mH to 1 H	0.70% to 0.94%	
		1 H to 10 H	0.94% to 0.67%	
8.	**Frequency$**	100 Hz to 10 MHz	0.0031%	Using Mutiproduct calibrator Make : Transmille Model : 3010 A by Direct Method
9.	**Oscilloscope$**			
a.	**Amplitude $ (DC)**	DC,2 mV/ div to 500 mV/ div @ 1 MΩ	0.08 % to 0.02 %	Using Mutiproduct calibrator Make : Transmille Model : 3010 A with scope option by Direct Method
		DC,1 V/ div to 20 V/ div@ 1 MΩ	0.03 % to 0.01 %	
b.	**Time Base$**	20 ns/ div to 500 ns/ div	0.006 % to 0.070 %	
		1 µs/ div to 500 µs/ div	0.006 % to 0.070 %	
		1 ms/ div to 500 ms/ div	0.006 % to 0.070 %	
		1 s/ div	0.09%	
c.	**Band width $ (Level Flatness)**	Upto 600 MHz	1.0 dB	Using Mutiproduct calibrator Make : Transmille Model : 3010 A with scope option by Direct Method

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
10. Temperature Simulation[#] (Indicator/ Controller/ Recorder/Calibrator)			
a. Thermocouple Type			
K Type	-190°C to 1370°C	0.25°C to 0.42°C	Using Multiproduct Calibrator Make : Transmille Model : 3010A & T.C. Simulator Transmille option : EA001A by Direct Method
J Type	-200°C to 1200°C	0.22°C to 0.37°C	
T Type	-240°C to 400°C	0.47°C to 0.26°C	
R Type	0°C to 1700°C	0.6°C to 1.18°C	
S Type	0°C to 1700°C	0.65°C to 1.63°C	
E Type	-250°C to 1000°C	0.38°C to 0.26°C	
N Type	-190°C to 1300°C	0.33°C to 0.48°C	
B Type	600°C to 1820°C	0.46°C to 1.82°C	
L Type	-200°C to 900°C	0.26°C	
U Type	-200°C to 600°C	0.28°C to 0.26°C	
b. RTD Type			
PT100	-200° C to 800°C	0.17°C to 0.64°C	
MEASURE			
1. DC Voltage[$]	10 mV to 100 mV	0.013% to 0.009%	Using 6½ Digit Precision Multimeter Make : Fluke Model :8846 A by Direct Method
	100 mV to 1 V	0.009% to 0.005%	
	1 V to 10 V	0.009% to 0.005%	
	10 V to 100 V	0.009% to 0.005%	
	100 V to 900 V	0.009% to 0.005%	
2. DC High Voltage[$]	1 kV to 5 kV	3.60% to 3.65%	Using Digital Multimeter HP973A and High Voltage ProbeMake : Fluke Model : 80 K-6 by Direct Method

	Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
3.	**AC Voltage[$]**	**50 Hz**		
		10 mV to 100 mV	0.62% to 0.50%	Using 6½ Digit Precision Multimeter Make : Fluke Model : 8846 A by Direct Method
		100 mV to 1 V	0.50% to 0.41%	
		1V to 10 V	0.41%	
		10 V to 900 V	0.41% to 0.97%	
4.	**AC High Voltage[$]**	**50Hz**		
		1kV to 5 kV	6.73% to 6.74%	Using Digital Multimeter HP973A and High Voltage ProbeMake : Fluke Model: 80 K-6 by Direct Method
5.	**DC Current[$]**	10 µA to 100 µA	0.35% to 0.06%	Using 6½ Digit Precision multimeter Make : Fluke Model : 8846 A
		100 µA to 1 mA	0.12% to 0.06%	
		1 mA to 100 mA	0.12% to 0.06%	
		100 mA to1 A	0.12% to 0.08%	
		1 A to 9 A	0.12% to 0.06%	
6.	**AC Current[$]**	**50 Hz**		
		10 µA to 100 µA	0.81% to 0.71%	Using 6½ Digit Precision multimeter Make : Fluke Model : 8846 A
		100 µA to 1 mA	0.71% to 0.58%	
		1 mA to 100 mA	0.58% to 0.18%	
		100 mA to 9A	0.18% to 0.21%	
		10 A to 1500 A	11.60% to 2.93%	
7.	**Resistance[$]**	10 Ω to 100 Ω	0.02%	Using 6½ Digit Precision multimeter Make : Fluke Model : 8846 A by Direct Method
		100 Ω to 1 kΩ	0.013%	
		1 kΩ to 10 kΩ	0.013%	
		10 kΩ to 100 kΩ	0.013%	
		100 kΩ to 1 MΩ	0.013%	
		1 MΩ to 10 MΩ	0.013% to 0.014%	
		10 MΩ to 100 MΩ	0.014% to 0.90%	

	Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
8.	**Inductance$**	**1 kHz**		
		1 mH to 10 mH	3.92%	Using LCR Meter
		10 mH to 100 mH	3.92%	Make : Mastech
		100 mH to 1 H	3.92%	Model : MS 5300 by
		1 H to 10 H	3.92% to 4.13%	Direct Method
9.	**Frequency$**	10 Hz to 1 MHz	0.012% to 0.058%	Using 6½ digit Multimeter Make : Fluke Model : 8846 A by Direct Method
10.	**Temperature Simulation# (Indicator/ Controller/ Recorder/ Calibrator)**			
a.	**Thermocouple Type**			
	K Type	-190°C to 1300°C	0.14°C to 0.13°C	Using Transmille
	J Type	-210°C to 1200°C	0.14°C to 0.13°C	Model : 3010 A
	T Type	-240°C to 390°C	0.27°C to 0.36°C	T.C. Simulator option :
	R Type	0°C to 1700°C	0.28°C to 0.36°C	EA001A by Direct
	S Type	0° C to 1700°C	0.27°C to 0.32°C	Method
	E Type	-240°C to 900°C	0.19°C to 0.14°C	
	N Type	-190°C to 1200°C	0.18°C to 0.11°C	
	B Type	600°C to 1800°C	1°C to 4°C	

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Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability (±)	Remarks
b. RTD Type			
PT100	-100° to 800°C	0.05°C to 0.15°C	Using 6½ Digit Multimeter, Make: Fluke, Model :8846A DMM by Direct Method

*** Measurement Capability is expressed as an uncertainty (±) 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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