

Laboratory **Yadav Measurements Private Limited, Plot No. 373-375, RIICO
Bhamashah Industrial Area, Kaladwas, Udaipur, Rajasthan**

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

Certificate Number **CC-2735 (In lieu of C-0035, C-0478,
C-0714)** **Page** **1 of 13**

Validity **23.07.2018 to 22.07.2020** **Last Amended on 30.08.2018**

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
<u>ELECTRO TECHNICAL CALIBRATION</u>				
I.	SOURCE			
1.	DC Voltage [#]	1 mV to 100 mV 100 mV to 1000 V	0.40 % to 0.013 % 0.013 % to 0.008 %	Using Fluke5500A/5502E by Direct Method
2.	DC Current [#]	1 mA to 100 mA 100 mA to 1 A 1 A to 20 A	0.021 % to 0.03 % 0.03 % to 0.05 % 0.05 % to 0.62 %	Using Fluke5500A/5502E by Direct Method
3.	Resistance [#]	1 m Ω 10 m Ω 1 Ω to 10 Ω 10 Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 330 M Ω 330 M Ω to 1 G Ω	0.6 % 0.20 % 0.06 % to 0.004 % 0.004 % to 0.015 % 0.015 % to 0.12 % 0.12 % to 1.2 % 1.5 %	Using Shunt by Direct Method Using Fluke5500A Decade resistance box & shunt by Direct Method
4.	AC Voltage [#]	50 Hz to 1 kHz 1mV to 1V 1 V to 700V 50Hz 480 V to 90 Kv	2.57% to 0.15% 0.25 % to 0.20% 0.50 %	Using Fluke5500A/5502E by Direct Method 6 ½ DMM & EMVT by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
5.	AC Current [#]	50 Hz to 1 kHz 1 mA to 1 A 50Hz 1A to 20A	0.35 %	Using Fluke5500A/5502E by Direct Method
6.	Frequency [#]	10 Hz to 2 MHz 2MHz to 225 MHz	0.015 % to 0.002% 0.002%	Using Fluke5500A/5502E + Signal generator by Direct Method
7.	HARMONIC Voltage , Current [#]	2nd to 40th harmonic 1 V to 240 V 10 mA to 100 A	0.6% 0.6%	Using MTS by Direct Method
8.	Voltage Ratio [#]	1- 2000 turns	0.25%	Using ratio tester calibrator by direct Sourcing
9.	Power Frequency ^b	40Hz to 70Hz @ 57.7V - 240V	0.0029 to 0.0052 Hz	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30
10.	Voltage Interruption, Dips And Swell ^s	50Hz 57.7V to 240V Dips & Interruptions: 0 to 100% Swell: 100 to 200% Incident time: 0.6S(30 Cycle)	For Amplitude 0.4 to 0.07% : For incident time 0.58%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
11.	Voltage Harmonics Voltage Inter harmonics/ Mains Signalling in Voltage ^s	50Hz 57.7V to 240V (2 nd to 50 th order) (0.1% to 16%)	0.34% to 0.4%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30 As per Table no 3,4 IEC 62586-2
12.	Power Quality Parameter Current Harmonics Current Interharmonics ^s	50Hz 1A to 5A (2 nd to 50 th order) (0.1% to 60%)	0.34% to 0.4%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30 As per Table no 3,4 IEC 62586-2
13.	Power Quality Parameter Total Harmonic distortion for Voltage and Current ^s	50Hz 57.7V to 240V 1A to 5A (2 nd to 50 th order)	0.34% to 0.8%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30
14.	Power Quality Parameter Voltage Unbalance ^s	57.7V to 240V (50Hz/60Hz) (0% to 5.2%) Phase displacement: 0 to 270°	0.4% to 0.07%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30
15.	Power Quality Parameter Current Unbalance ^s	1A to 5A (50Hz/60Hz) (0% to 18.1%) Phase displacement: 0 to 270°	0.07% to 0.08%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
16.	Power Quality Parameter Flicker/Voltage Fluctuations Sinusoidal / Rectangular modulation ^s	50/60Hz 230V/120V (1CPM to 4800CPM) Pst:- 0.2 to 10 Pinst =1	0.33% to 0.65%	Using Omicron , CMC 256plus Direct Method IEC 61000-4-30/IEC 61000-4-15 Table 1,2,5 Only
II.	MEASURE			
1.	DC Voltage [#]	1 mV to 5 mV 5 mV to 10 mV 10 mV to 40 mV 40 mV to 1000 V	0.13 % to 0.03 % 0.03 % to 0.014 % 0.014 % to 0.005 % 0.005 % to 0.004 %	Using 8½ DMM HP3458 Direct Method
2.	DC Current [#]	1 mA to 100 mA 100 mA to 1 A 1 A to 20A	0.01 % 0.01 % to 0.03 % 0.03 % to 0.60 %	Using 8½ DMM HP3458 by Direct Method 8½ DMM HP345 using Shunt by Direct Method
3.	Resistance [#]	1 m Ω to 100 m Ω 0.1 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 330 M Ω 330 M Ω to 1 G Ω	0.5 % to 0.2 % 0.2 % to 0.06 % 0.06 % to 0.004 % 0.004 % to 0.015 % 0.015 % to 0.12 % 0.12 % to 1.2 % 1.2 %	Using $\mu\Omega$ meter by Comparison Method Using 8½ DMM HP3458 by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
4.	AC Voltage [#]	40 Hz to 70 Hz 10 V to 480 V	0.011 %	Using COM3003 & 8 ½ DMM Direct Method/ Comparison Method
		50 Hz 480V to 90 kV	0.25 %	Using 6 ½ DMM & STD (6.6kV), 33 kV Capacitor &EPD& EMVT & MTE/MT3000 COM3003 & 6 ½ DMM Standard PT (6.6kV), 132 kV EMVT & MTE/MT3000 Direct Method/ Comparison Method
		50Hz to 1 kHz 1mV to 1V 1 V to 120 V 120 V to 700 V	0.50% to 0.15% 0.15 % to 0.10 % 0.10 % t o 0.13 %	Using 8 ½ DMM HP 3458 Direct Method
		1 kHz 10 mV to 1 V	0.07 % to 0.016 %	Using 8 ½ DMM HP 3458 Direct Method
		1 kHz to 300 kHz 0.5 V to 10 V	0.4%	Using 8 ½ DMM HP 3458 Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
5,	AC Current [#]	40 Hz to 70 Hz 1 mA to 10 mA >10 mA to 50 mA >50 mA to 100A >100A to 120 A 50 Hz to 1 kHz 1 mA to 1 A 50Hz 120A to 2000A	0.04 % to 0.031 % 0.013% 0.007 % 0.021% 0.35 % 0.10%	Using MTS/PTS/VCS/ COM3003 Direct Method/ Comparison Method Using 8 ½ DMM HP 3458 Direct Method/ Comparison Method Using ELTEL CT set up & MTE /MT3000 by Direct Method/ Comparison Method
6,	Frequency [#]	10 Hz to 225 MHz	0.002%	Using 53131A Frequency Counter by Comparison Method
7,	Power Factor [#] / Phase Angle [#]	40Hz to 70 Hz cos ϕ =0.01 to 1 Lead sin ϕ =0.01 to 1 Lead 0° to 360°	0.005P.F 0.012°	Using COM 3003 by Direct Method/ Comparison Method
8,	Time ^s	5 s to 10000 s	0.03 s to 0.60 s	Using 53131A Frequency Counter by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
10.	AC Power/Energy [#] 1 phase & 3 phase Active Cos θ \pm 0.01 to 0.1	40 Hz to 70 Hz 10 V to 40V 0.1 A to 120 A 10 mW to 1.44 kW 40 Hz to 70 Hz 40 V to 320V 1 mA to 120 A 4 mW to 11.52 kW 50Hz 320 V to 1000 V 0.1A to 20 A 3.2 mW to 6kW	0.05% 1%	Using COM 3003, Make: ZERA by Comparison Method Using PT/MT3000/CALMET by Comparison Method
11.	Current Transformer [#] (Primary Injection) Ratio Error Phase Error	1 A to 5A (Primary) 1 A, 5 A (Secondary) 5 A to 2000 A (Primary) 1 A, 5 A (Secondary) 2000 A to 10000 A (Primary) 1 A, 5 A (Secondary)	0.06% 3.02 min 0.01% to 0.017% 0.70 to 0.84 min 0.05 % 2.5 min	Using Precision current transformer & Automatic Instrument transformer test set (AIITS) by Direct Method
12.	Current Transformer [#] (Secondary Injection) Ratio Error Phase Error	10 A to 10000 A (Primary) 1 A, 5 A. (Secondary) 5 A (Primary) 5 A (Secondary)	0.10 % 2.8 min	Using Portable CT/VT Calibrator by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
13.	Voltage Transformer / Capacitor VOLTAGE TRANSFORMER/ VOLTAGE DIVIDER [#] Ratio Error Phase Error	110V to 2.2 kV (Primary) 2.2 kV to 6.6 kV(Primary) 6.6 kV to 11 kV(Primary) 11 kV to 33 kV(Primary) 33 kV to 132 kV (Primary) 50 V to 144 V (Secondary)	0.09 % , 4 min 0.10%, 2.5min 0.10 % to 0.016% 1.5 min 0.016 % , 1.5 min 0.018 % 2.0 min	Using Automatic Instrument transformer test set (AIITS) & EMVT by Direct Method
14.	Voltage Transformer / Capacitor Voltage Transformer/ Voltage Divider [#] , Ratio Error, Phase Error	2.2 kV to 33 kV (Primary) 50 V to 144 V (Secondary)	0.15% 5.6 min	Using Portable CT/VT calibrator by Direct Method
15.	CT-VT Comparator / Bridge [#]	Current :-1 A , 5 A Ratio error Phase error Voltage :- 63.5 V, 110 V Ratio error Phase error	0.007 – 0.012%, 0.31 – 0.51min 0.01 % 0.50 min	Using Precision current transformer & Automatic Instrument transformer test set (AIITS) &EMVT by Comparison Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
16.	Harmonic, Total Harmonic Distortion, Distortion Factor [#]	2nd to 40th harmonic 1 V to 240 V 10 mA to 100 A	0.6 % 0.6 %	Using COM 3003 by Direct Method/Comparison Method
17.	Capacitance [#]	1kHz 1 nF to 300 nF 300 nF to 30 μ F 30 μ F to 1 Mf	0.23 % to 0.55% 0.55% to 2.0% 2.0% to 0.55%	Using LCR meter by Direct Method
18.	Capacitance & Tan [#] Up to 12kV	Cap :10 pF to 1000 pF Tan δ : 5% to 0.01%	2.00 % to 1.25% 1.0%	Using C & Ten delta tester by Direct Method
19.	Magnetic Field AC Magnetic Field DC Magnetic Field ^{\$}	0.5 Gauss to 2000 Gauss 100 Gauss to 5000 Gauss	6.90 % to 4.0 % 5.31 % to 2.9 %	Using Gauss Meter by Direct/comparison Method

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FLUID FLOW CALIBRATION

I. FLOW FLUID				
1.	Quantity by Volume (air) [§]	(a) 0.003 to 0.01 m ³ At flow rate range of 0.016 to 0.040 m ³ /hour (b) 0.01 to 0.08 m ³ At flow rate range of 0.040 to 6.6 m ³ /hour	0.62 % 0.17%	Using Bell Prover at temp.(20 \pm 1) ^o C & at pressure Atm +5mbar by Comparison method with reference standard (Bell Prover)
2.	Flow rate by volume (air) [§]	(a) 0.016 to 0.040 m ³ /hour For collection volume range of 0.003 to 0.01 m ³ (b) 0.040 to 6.6 m ³ /hour For collection volume range of 0.01 to 0.08m ³	0.62 % 0.19%	Using Bell Prover at temp.(20 \pm 1) ^o C & at pressure Atm +5mbar by Comparison method with reference standard (Bell Prover)

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
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THERMAL CALIBRATION

I.	TEMPERATURE			
1.	RTD ^s	(-)10 to 95 °C	0.03°C	Using PRT (PT 25) with thermometer read out & liquid bath by Comparison method
2.	Temperature Indicator With Probe ^s	(-)10 to 95 °C	0.07°C	Using PRT (PT 25) with thermometer read out & liquid bath by Comparison method
3.	Thermocouple ^s	(-)10 to 95 °C	0.14°C	Using PRT (PT 25) with thermometer read out & liquid bath by Comparison method
4.	Thermometer Read Out Inbuilt/External Sensor ^s	(-)40 to 150 °C	0.93°C	Using SPRT with read out & Environmental chamber by Comparison method
5.	Humidity Indicator With Or Without Sensor ^s	RH 18% to 98% @ 20°C & 50% to 98 % Rh @ 20°C to 70°C	1.75%	Using Temperature & Rh indicator with sensor, Environmental chamber by Comparison method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability (\pm)	Remarks
6.	Environmental chamber [§]	(-)40 to 100 °C 100 to 150°C	1°C 1.4°C	Using RTD's (Minimum 9) with Data Acquisition System, Multi point calibration by Direct Method
II. SPECIFIC HEAT AND HUMIDITY				
1.	Environmental chamber [§]	Rh 18% to 98% @ 20°C & 50% to 98 % Rh @ 20°C to 70°C	3%	Using RTD's (Minimum 9) with Data Acquisition System, Temperature & Rh indicator with sensor, Multi point calibration by comparison Method
2.	Environmental chamber [*]	-40 to 100 °C 100 to 150°C	1°C 1.4°C	Using RTD's (Minimum 9) with Data Acquisition System, Multi point calibration by comparison Method
3.	Environmental chamber [*]	Rh 18% to 98% @ 20°C & 50% to 98 % Rh @ 20°C to 70°C	3%	Using RTD's (Minimum 9) with Data Acquisition System, Temperature & Rh indicator with sensor, Multi point calibration 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

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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