ESSJAY TECHNOMEASURE PVT. LTD.

(A House of Calibration Engineering & Allied Services)

Apartment No. : D 1, 3rd Floor, 36, Kantapukur 3rd Bye Lane, Howrah - 711 101

Ph.: 033 26670835, 9674756762, website : www.technomeasurenabl.com

E-mail : technomeasure@gmail.com

DOC No. :TM/CALI/04

CC-2628

Calibration Certificate

Issued to,
M/s. M.B. Control & Systems Pvt. Ltd.
31/1, Ahiripukur Road, Kolkata,
Pin: 700 019, W.B.

ULR No.: CC262822000015220F
Certificate No.: 2204008/M899/01
Date : 04.04.2022

Date of Calibration	Recommended Due On (As agreed With Customer)	Page No. :
02.04.2022	02.04.2023	1of 1

Location of Calibration : At Lab
Date of Receipt : 01.04.2022
Description of the instrument : PV Module Temperature Sensor
Make : M.B. Control & Systems Pvt. Ltd.
Model: MBMet-801B Type: Pt-1000
Range: (-)40 °C to 110 °C

Identification Number of Instrument : Sl.No: MB 2204001
Method Used : As per Work Instruction
(WI- 01, Sec No.: QWI - 21,Rev No:3,Rev Date:30.12.2019)
Sec No :QWI/TH/ANNEX-I Rev No.:1,Rev Date:26.12.2017)

Details of Major Equipment used for Calibration

Description	Traceability Certificate No. & Issue Date	Valid upto	Calibration Agency
RTD	TL/021/730.1.1, Dated : 30.07.2021	28.07.2022	Tempsens Calibration Center
Digital Precision Multimeter	NTH(ER)/CAL(EL)/2021/0044 Dated: 27.09.2021	06.09.2022	NTH (ER)
Traceability : Standards used for calibration are traceable to National Standards through NABL accredited Laboratory			

Customer's Specification : Provided by the Customer.
Environmental conditions of measurement : Temperature: 25±2°C Humidity: (30 to 75)% RH

Thermal Calibration

Calibration Results

Point	Average observed reading of DUC*		Average observed reading of Standard in °C	Error in °C	Measurement Uncertainty at 95% C.L (Coverage Factor k=1.96 ,± in °C)
	DUC* in ohm	Corresponding value in °C			
-30°C	881.4	-30.21	-30.215	0.005	0.88
0°C	1000.1	0.02	0.025	-0.005	0.88
50°C	1193.3	49.82	49.852	-0.032	0.88
100°C	1384.2	99.78	99.845	-0.065	0.88
110°C	1421.3	109.56	109.689	-0.129	0.88

Note: The above results are found within Class A, as per IEC 60751 ed 2.0 (IEC 60751:2008)

Remarks :1.The Instrument is visually checked & found ok ,DUC*=Device Under Calibration , Std. = Standard
2.This calibration certificate refers to the value observed at the time of and under the stated conditions measured
3.This certificate should not be produced other than a full with written approval from the head of the calibration Laboratory
4.The above results relate only to the item calibration.

----------END OF CERTIFICATE ----------

Calibrated By
Bishal Gupta
(Calibration Engineer)

ESSJAY TECHNOMEASURE PVT. LTD. HOWRAH

Authorised Signatory
KIRTY TRIPATHI
Deputy Technical Manager

MEMORANDUM

- Instruments / Equipments used for calibration were calibrated & traceable to National & International Standards.
- This Certificate refers only to particular item(s) submitted for calibration.
- **ESSJAY TECHNOMEASURE PVT. LTD.** is not liable for any change in calibration data & performance specification on account of malfunctioning Standards / Instruments / Equipment cover by this certificate due to damage caused to it after issuance of this certificate.
- The calibration results reported are valid at the time of and under the stated conditions of the measurements.
- This Certificate shall not be reproduced in full/part without prior permission of **ESSJAY TECHNOMEASURE PVT. LTD.**
- Satisfactory calibration report in no ways implies that the equipment calibrated is approved by NABL.

All precautions have been taken for any error or omission while calibrating the instruments and issuing this certificate. However **ESSJAY TECHNOMEASURE PVT. LTD.** shall not be liable for any loss or liability that may be arise to any party in this regards.

TEMPSENS

Certificate No. CC-2840

TEMPSENS CALIBRATION CENTRE
A Division of Tempsens Instruments (i) Pvt. Ltd.
B-188A, ROAD NO. 5, M.I.A., UDAIPUR-313003 INDIA
✆ : +91-294-3507715, Fax:+91-294-2492447, 3507731
E-mail : lab@tempsens.com, Website : www.tempsens.com

Calibration Certificate No. : TL/021/730.1.1
ULR No. : CC284021000004120F

M/S ESSJAY TECHNOMEASURE PVT. LTD. 36, KANTAPUKUR, 3RD BYE LANE, FLAT NO. D1, 3RD FLOOR, HOWRAH-711101	J.O.NO. Received Date Calibration Date Next Cali. Due On Issue Date	: T/221/2/21130010061 : 29/07/2021 : 29/07/2021 : 28/07/2022 : 30/07/2021

Sample Description :

Calibration Required at	: -80, -30, 0, 100, 250 & 400°C
Item	: PT100X1, SIMPLEX, 4 WIRE RTD
Inst. Sr. No.	: 18920
Length & Dia.	: 300MM & 6MM
Location	: At Lab
Condition of Item	: Satisfactory

Calibration Procedure The UUC was allowed to be stable at specified temperature points. The reading of Standard and UUC was recorded.This Certificate Format No. F-LAB-6. The report provides the reading and deviation. As per work instruction no. WI-LAB-16 Temperature (in °C) against RTD reading (in Ohms) are calculated by using ASTME-1137/E1137M-04. Minimum Immersion depth for RTD is 100mm.

The UUC has been compared with the following working standards of sensor & measuring instrument.

Standards	Traceable To	Certificate No.	Valid Up to
SSPRT PRECISION THERMOMETER CALSYS 80/50 CALSYS 300 CALSYS 650	TEMPSENS, UDAIPUR YMPL, Udaipur	TL/021/493.3.1 YMPL/335943/126362	28.05.2022 06.07.2023

The Standards used for calibration is traceable to National / International Standard.
The results of calibration are as under :

Sr. No.	Standard Sensor °C	UUC		Dev. °C	Expanded uncertainty (±°C)
		Ohms	°C		
1	-79.87	68.466	-79.65	0.22	0.10
2	-29.96	88.297	-29.81	0.15	0.10
3	0.05	100.055	0.14	0.09	0.10
4	99.85	138.540	100.09	0.24	0.10
5	249.81	194.225	250.35	0.54	0.15
6	399.75	247.237	400.42	0.67	0.20

Temperature Scale: ITS -90 Ambient Temp. : 25±2°C Relative Humidity : 50±20%RH

Calibrated By Checked By Certified By

Alpesh Parakh
Technical Manager

Note:
(1) The calibration results reported in this certificate are valid at the time of and under the stated condition of measurement for the particular sample.
(2) The report shall not be reproduced except in full, without written permission of the laboratory
(3) Coverage factor "k" =2 at approx 95.45% confidence level.
(4) Next Calibration Due Date mentioned as per customer requirement.

FORM NO : NTH/SL/F/5

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राष्ट्रीय परीक्षण शाला (पूर्वी क्षेत्र)
National Test House (Eastern Region)

ब्लॉक - सी पी, सेक्टर - 5, साल्ट लेक सीटी, कोलकाता - 700 091
Block-CP, Sector-V, Salt Lake City, Kolkata - 700 091

Certificate No.
CC-3109

केलिब्रेशन प्रमाण-पत्र
CALIBRATION CERTIFICATE

केलिब्रेशन प्रमाण पत्र सं. Calibration Certificate No	NTH(ER)/CAL(EL)/2021/0044	जारी होने की तिथि Date of Issue	27/09/2021

केलिब्रेशन की तिथि Date of Calibration	अगला केलिब्रेशन का बकाया Next Calibration due on	पृष्ठ Page	पृष्ठों की संख्या No of Pages
06/09/2021	06/09/2022	1	5

कोड नं Code No	1630481874661
जिसे जारी करना है Issued to	ESSJAY TECHNOMEASURE PVT. LTD. 36 Kantapukur, 3rd Bye Lane,Flat No. D1,3rd Floor,Howrah-711101
ग्राहक का सन्दर्भ सं. एवं दिनांक Customer's reference No & Date	TM/CALI/NTH/L428 25/08/2021
पंजिका सं. एवं दिनांक Register No & Date	0044/NTH(ER)/CAL(EL)/03/09/2021
नमुना प्राप्ति की तिथि Date of Receipt of Sample	01/09/2021
केलिब्रेशन के अंतर्गत सामग्री का विवरण Description of Sample for Calibration	6.5 Digits Precision Multimeter,Make: Fluke,Model:8846A,Serial No.: 1758018
माप-क्रम एवं विभाजन Scales & Divisions	Voltage,Current,Resistance, Frequency,Capacitance
व्यावहृत प्रणाली का पहचान Identification of the method used	NTH/DMM/01
पर्यावरणी अवस्था Environmental Conditions	Temperature: 25+/-4 deg C,Relative Humidity: 30 - 75%
व्यावहृत मुख्य मानकों/ उपकरणों Major Standards/Equipments used	Multiproduct Calibrator 5520A,Fluke,USA;Reference Multimeter,Fluke,8508A.
केलिब्रेशन स्थल Site of Calibration	At NTH Laboratory
मापन कार्यों का अनुमार्गन Traceability of measurements	NPL,New Delhi vide Certificate No.NTH(ER)/CAL(EL)/IH/2021/5520A dated 18.03.2021,ERTL(E)/CAL/N076/0017/06-20 dated 10.09.2020.
केलिब्रेशन स्टिकर पर रा.प.शा का पहचान चिह्न NTH Identification Mark on Calibration Sticker	NTH(ER)/CAL(EL)/2021/0044

Calibrated By	Checked By	Approved By
Anirban Guha SO Electrical	Biswa Ranjan Mandal Scientist- C (Electrical)	Biswa Ranjan Mandal Scientist- C (Electrical)

भारत सरकार
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राष्ट्रीय परीक्षण शाला (पूर्वी क्षेत्र)
National Test House (Eastern Region)

ब्लॉक - सी पी, सेक्टर - 5, साल्ट लेक सीटी, कोलकाता - 700 091
Block-CP, Sector-V, Salt Lake City, Kolkata - 700 091

ULR No.CC310921100000057F

CALIBRATION CERTIFICATE
of 6½ Digits Precision Multimeter
Certificate No.
NTH(ER)/CAL(EL)/2021/0044

Date of Calibration 06.09.2021

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Results of Calibration: As desired the sample was subjected to accuracy test of AC / DC Voltage & Current, Frequency,Capacitance and Resistance with the results given below:

Sl. No.	Unit	Range	Set value of the Standard in corresponding unit	Average indicated value of EUC* in corresponding	Expanded Uncertainty in corresponding unit at CL 95% & k = 2
Parameter:	**DC Voltage**				
1	mV	100 mV	1.00000	1.0001	0.0013
2			3.00000	2.9994	0.0039
3			10.00000	9.9994	0.0130
4			15.00000	14.9989	0.0195
5			20.00000	19.9979	0.0260
6			30.00000	29.9968	0.0390
7			50.00000	49.9966	0.0650
8			100.00000	100.0002	0.017
9	V	1 V	0.1000000	0.099999	0.0002
10			0.5000000	0.499900	0.0002
11			1.0000000	0.999899	0.0002
12		10 V	1.000000	0.99980	0.0002
13			5.000000	4.99900	0.0003
14			10.000000	9.99790	0.0017
15		100 V	10.00000	9.9979	0.0005
16			50.00000	49.9979	0.0025
17			100.00000	99.9988	0.0050
18		1000 V	100.0000	99.997	0.0050
19			500.0000	449.996	0.0250
20			1000.0000	999.998	0.0500
Parameter:	**DC Current**				
1	µA	100 µA	10.00000	9.9952	0.026
2			100.00000	99.9946	0.050
3	mA	1 mA	0.5000000	0.499875	0.0003
4			1.0000000	0.998654	0.0005
5		10 mA	5.000000	4.99846	0.0025
6			10.000000	9.99325	0.0050
7		100 mA	50.00000	49.9653	0.0250
8			100.00000	99.9822	0.0500
9		400 mA	200.0000	199.986	0.1000
10			400.0000	399.986	0.2000
11	Amp	1 Amp	0.5000000	0.499875	0.0003
12			1.0000000	0.998745	0.0005
13		3 Amp	2.000000	1.99875	0.0010
14			3.000000	2.99875	0.0015
15		10 Amp	5.000000	4.99852	0.0060
16			10.000000	9.96321	0.0120

EUC* - Equipment Under Calibration

Calibrated by
Anirban Guha
SO Electrical

Checked by
Biswa Ranjan Mandal
Scientist-C (Electrical)

Approved by
Biswa Ranjan Mandal
Scientist-C (Electrical)

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Date of Calibration 06.09.2021

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Sl. No.	Unit	Range	Set value of the Standard in corresponding unit	Average indicated value of EUC* in corresponding unit	Expanded Uncertainty in corresponding unit at CL 95% & k = 2
Parameter:			AC Voltage at 50 Hz		
1	mV	100 mV	1.00000	0.9902	0.009
2			10.00000	9.9904	0.090
3			50.00000	49.9902	0.450
4			100.00000	99.9743	0.070
5	V	1 V	0.1000000	0.099965	0.001
6			0.5000000	0.499965	0.001
7			1.0000000	0.999640	0.001
8		10 V	1.000000	0.99954	0.001
9			5.000000	4.99954	0.002
10			10.000000	9.99993	0.004
11		100 V	10.00000	9.9995	0.004
12			50.00000	49.9924	0.020
13			100.00000	99.9522	0.040
14		1000 V	100.0000	99.995	0.040
15			500.0000	449.992	0.200
16			1000.0000	999.965	0.400
Parameter:			AC Voltage at 1 KHz		
1	mV	100 mV	1.00000	0.9892	0.009
2			10.00000	9.9890	0.090
3			50.00000	49.9850	0.450
4			100.00000	99.9874	0.070
5	V	1 V	0.1000000	0.099897	0.001
6			0.5000000	0.499897	0.001
7			1.0000000	0.998964	0.001
8		10 V	1.000000	0.99795	0.001
9			5.000000	4.99795	0.002
10			10.000000	9.99979	0.004
11		100 V	10.00000	9.9995	0.004
12			50.00000	49.9892	0.020
13			100.00000	99.9435	0.040
14		1000 V	100.0000	99.995	0.040
15			500.0000	449.992	0.200
16			1000.0000	999.965	0.400

EUC* - Equipment Under Calibration

Calibrated by
Anirban Guha
SO Electrical

Checked by
Biswa Ranjan Mandal
Scientist-C (Electrical)

Approved by
Biswa Ranjan Mandal
Scientist-C (Electrical)

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ULR No.CC310921100000057F

CALIBRATION CERTIFICATE
of 6½ Digits Precision Multimeter
Certificate No.
NTH(ER)/CAL(EL)/2021/0044

Date of Calibration 06.09.2021

SRF No.: 1630481874661 | **Page** 04 | **No. of Pages** 05

Sl. No.	Unit	Range	Set value of the Standard in corresponding unit	Average indicated value of EUC* in corresponding unit	Expanded Uncertainty in corresponding unit at CL 95% & k = 2
Parameter:	**AC Current at 50 Hz**				
1	µA	100 µA	30.00000	29.9745	0.150
2			100.00000	99.9871	0.500
3	mA	1 mA	0.5000000	0.498988	0.0025
4			1.0000000	0.998496	0.0050
5		10 mA	5.000000	4.99813	0.0250
6			10.000000	9.98490	0.0500
7		100 mA	50.00000	49.9347	0.2500
8			100.00000	99.9578	0.5000
9		400 mA	200.0000	199.958	1.0000
10			400.0000	399.959	2.0000
11	Amp	1 Amp	0.5000000	0.495988	0.0005
12			1.0000000	0.996875	0.0010
13		3 Amp	2.000000	1.99797	0.0020
14			3.000000	2.99087	0.0157
15		10 Amp	5.000000	4.99279	0.0115
16			10.000000	9.96184	0.0200
Parameter:	**AC Current at 1 kHz**				
1	µA	100 µA	30.00000	29.9711	0.150
2			100.00000	99.9838	0.500
3	mA	1 mA	0.5000000	0.498370	0.0025
4			1.0000000	0.998081	0.0050
5		10 mA	5.000000	4.99770	0.0250
6			10.000000	9.98062	0.0500
7		100 mA	50.00000	49.9324	0.2500
8			100.00000	99.9534	0.5000
9		400 mA	200.0000	199.951	1.0000
10			400.0000	399.952	2.0000
11	Amp	1 Amp	0.5000000	0.495110	0.0018
12			1.0000000	4.992787	0.0115
13		3 Amp	2.000000	1.99749	0.0025
14			3.000000	2.98998	0.0175
15		10 Amp	5.000000	4.99279	0.0115
16			10.000000	9.95770	0.0200

EUC* - Equipment Under Calibration

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ULR No.CC310921100000057F

CALIBRATION CERTIFICATE

of 6½ Digits Precision Multimeter

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Sl. No.	Unit	Range	Set value of the Standard in corresponding unit	Average indicated value of EUC* in corresponding unit	Expanded Uncertainty in corresponding unit at CL 95% & k = 2
Parameter:			**DC Resistance(4 Wire)**		
1	Ω	10 Ω	1.000000	0.99991	0.001
2			5.000000	4.99990	0.003
3			10.000000	9.99461	0.006
4		100 Ω	19.00000	18.9995	0.0114
5			50.00000	49.9875	0.0300
6			100.00000	99.9995	0.0600
7	kΩ	1 kΩ	0.2000000	0.199994	0.0002
8			1.0000000	0.995912	0.0006
9		10 kΩ	2.000000	1.99422	0.0012
10			10.000000	9.99845	0.0060
11		100 kΩ	20.00000	19.9985	0.0120
12			100.00000	99.9921	0.0600
Parameter:			**DC Resistance(2 Wire)**		
13	MΩ	1 MΩ	0.2000000	0.199991	0.0002
14			1.0000000	0.999890	0.0002
15		10 MΩ	2.000000	1.99942	0.0002
16			10.000000	9.99985	0.0006
17		100 MΩ	20.00000	19.9987	0.1200
18			100.00000	99.9242	0.6000
Parameter:			**Frequency**		
1	Hz	Auto	10.000000	10.0000	0.006
2			50.000000	50.0000	0.030
3			100.000000	100.0000	0.0600
4	kHz		1.0000000	1.00001	0.0600
5			10.000000	10.00010	0.0060
6			100.000000	100.0066	0.0600
7			1000.00000	1000.011	0.6000
Parameter:			**Capacitance**		
1	nF	Auto	1.0000000	0.998524	0.0060
2			10.000000	9.98541	0.0600
3			100.00000	99.9652	0.6000
4	μF		1.0000000	0.982214	0.0060
5			10.000000	9.95487	0.0600
6			100.00000	99.9652	0.6000

The EUC* value mentioned above is the average of 5 readings.

The reported expanded uncertainty is at coverage factor k=2 which corresponds to a coverage probability of approximately 95% for a normal distribution.

EUC* - Equipment Under Calibration

Calibrated by
Anirban Guha
SO Electrical

Checked by
Biswa Ranjan Mandal
Scientist-C (Electrical)

Approved by
Biswa Ranjan Mandal