

DISCLAIMER

This report is being made available for informational purposes only and the results contained therein have not been verified or confirmed by ZENN. No inference should be drawn from the posting of this report on the zencars.com website that ZENN has adopted the report or any of the information or data contained therein and readers are cautioned not to place any reliance on the report or any of the information or data contained therein.



CERTIFICATION OF MEASUREMENTS

This report certifies that the measurements performed and detailed below, performed by the listed customer, were witnessed and verified by Tescom senior metrology engineering staff below. Witnessed measurements included in this CERTIFICATION OF MEASUREMENTS report were performed in accordance with accepted metrological practices, and are traceable to the U.S. National Institute of Standards and Technology, as detailed in each measurement. This document applies only to measurements listed and described herein.

MEASUREMENT DATE: 27 September, 2013

MEASUREMENT LOCATION: EESTOR, Inc.
715 Discovery Boulevard, Bldg I, Suite 107
Cedar Park, Texas 78613

CUSTOMER NAME/CONTACT: EESTOR, Inc. / Richard Weir
ZENN Motor Company / Roger Hammock

MEASUREMENTS MADE BY: Richard Weir, and EESTOR Staff

OBSERVED/WITNESSED BY: Jerry L. Eldred, Senior Metrology Engineer, Tescom USA

MEASUREMENT 1 – EESTOR REFERENCE CAPACITANCE TEST BOARD

EESTOR CAPACITANCE REFERENCE TEST BOARD (Nominal value 0.8378 μF at 100 Hz / 1 Vrms)

Instrument: Quadtech 1715 LCR Meter Serial Number: AAQ17150350
Calibrated by Tescom 28 May 2013, Due 28 May 2014.

Technique: EESTOR Reference Calibration board was connected directly to, and measured using the calibrated LCR meter above, after running **OPEN** and **SHORT** routines (both routines **PASS**ed).

Measured Value: 0.8385 μF / Dissipation Factor: 0.0004



MEASUREMENT 2 – LAYER DATED “3-15-13”

MEASUREMENT 2A: CAPACITANCE VERSUS FREQUENCY

Instrument: Hewlett-Packard 4192A (Capacitance Transfer Standard)
 Technique: Verified capacitance vs. frequency using H-P 4192A Impedance Analyzer (Transfer Standard), with model 16047A input fixture and interface cabling. Values correlated against EESTOR Reference Capacitance Board.

Measured Values:

FREQUENCY (Hz):	100	80	60	30	20	10	8
CAPACITANCE (nF):	0.24	0.24	0.3	0.3	0.4	1.6	1.3

MEASUREMENT 2B: RESISTANCE MEASUREMENT

Instrument: Alpha Lab High Resistance Meter (Resistance Transfer Standard) & Caddock 10 Giga Ohm resistors calibrated 21 May 2013 by Tescom.
 Technique: Verified using high resistance meter; which was verified using set of Caddock 10 Giga Ohm resistors calibrated by Tescom.

Measured Value: 76 Giga Ohms

MEASUREMENT 2C: THICKNESS MEASUREMENT

Instrument: Keyence model 260-248-8030 Serial Number: 92017014 Calibrated by Tescom 26 June 2013 Due 26 June 2014

Technique: Zero thickness meter on stainless steel substrate. Place intermediate metal plate (measured at 26.8 microns) to minimize zeroing error. Then and reference sample of copper substrate (same as copper backing on reference samples (measured at 36.8 microns) – to be mathematically subtracted from calculated value. Copper reference is removed (intermediate metal plate remains). Layer is inserted and measured. The layer contains a copper backing of equal thickness to above copper reference. The sum value of the copper sample and metal plate are subtracted to derive actual measured thickness of LAYER sample.

Measured Value: 153.7 microns (actual/corrected)

MEASUREMENT 2D: WATT HOUR TESTING

Instruments: Yokogawa WT3000 Precision Power Analyzer (Power Transfer Standard)
 EESTOR Capacitance Test Board Calibrated via MEASUREMENT 1 above
 Stanford Research high voltage power supply
 Calibrated by Tescom 19 March 2013, Due 19 March 2014

Technique: EESTOR Capacitance Test Board is used to establish a reference for Watt-hour measurements made by application of high voltage from the calibrated Stanford Research HV supply to the calibrated capacitance test board and measured with the Yokogawa analyzer. Watt-hour measurements subsequently made with the capacitance test board (known capacitance value) with a known applied voltage value establish a correlation to provide quantitative confidence in readings from the Yokogawa analyzer. Note: Watt-hour values established as above on date of these measurements (27 Sept 2013) matched to within 0.4% of expected measurand value. The LAYER sample is then substituted into the correlated measurement system (all above instruments), and Watt hour values are measured listed values of applied voltage.

Measured Values:

VOLTAGE (VDC):	500	750	1000
WATT-HOURS:	0.713 μ W Hours	8.13 μ W Hours	48.7 μ W Hours



MEASUREMENT 3 – LAYER DATED “10-9-12”

MEASUREMENT 3A: CAPACITANCE VERSUS FREQUENCY

Instrument: Hewlett-Packard 4192A (Capacitance Transfer Standard)
Technique: Verified capacitance vs. frequency using H-P 4192A Impedance Analyzer (Transfer Standard), with model 16047A input fixture and interface cabling. Values correlated against EESTOR Reference Capacitance Board.

Measured Values:

FREQUENCY (Hz):	100	80	60	30	20	10	8	5
CAPACITANCE (nF):	0.47	0.51	0.6	0.8	1.0	1.9	2.6	4

MEASUREMENT 3B: RESISTANCE MEASUREMENT

Instrument: Alpha Lab High Resistance Meter (Resistance Transfer Standard) & Caddock 10 Giga Ohm resistors calibrated 21 May 2013 by Tescom.
Technique: Verified using high resistance meter; which was verified using set of Caddock 10 Giga Ohm resistors calibrated by Tescom.

Measured Value: 660 Mega Ohms

MEASUREMENT 3C: THICKNESS MEASUREMENT

Instrument: Keyence model 260-248-8030 Serial Number: 92017014 Calibrated by Tescom 26 June 2013 Due 26 June 2014
Technique: Zero thickness meter on stainless steel substrate. Place intermediate metal plate (measured at 26.8 microns) to minimize zeroing error. Then and reference sample of copper substrate (same as copper backing on reference samples (measured at 36.8 microns) – to be mathematically subtracted from calculated value. Copper reference is removed (intermediate metal plate remains). Layer is inserted and measured. The layer contains a copper backing of equal thickness to above copper reference. The sum value of the copper sample and metal plate are subtracted to derive actual measured thickness of LAYER sample.

Measured Value: 75.8 microns (actual/corrected)

MEASUREMENT 3D: WATT HOUR TESTING

Instrument: Yokogawa WT3000 Precision Power Analyzer (Power Transfer Standard) EESTOR Capacitance Test Board Calibrated via MEASUREMENT 1 above Stanford Research high voltage power supply
Calibrated by Tescom 19 March 2013, Due 19 March 2014

Technique: EESTOR Capacitance Test Board is used to establish a reference for Watt-hour measurements made by application of high voltage from the calibrated Stanford Research HV supply to the calibrated capacitance test board and measured with the Yokogawa analyzer. Watt-hour measurements subsequently made with the capacitance test board (known capacitance value) with a known applied voltage value establish a correlation to provide quantitative confidence in readings from the Yokogawa analyzer. Note: Watt-hour values established as above on date of these measurements (27 Sept 2013) matched to within 0.4% of expected measurand value. The LAYER sample is then substituted into the correlated measurement system (all above instruments), and Watt hour values are measured listed values of applied voltage.

Measured Values:

VOLTAGE (VDC):	250	500	750
WATT-HOURS:	5.3 μ W Hours	25.7 μ W Hours	199 μ W Hours



TESCOM CALIBRATION SERVICES

15527 Ranch Road 620 North

Austin, Texas 78717

1(800)888-1978

MEASUREMENT 4 – LAYER DATED “9-24-13”

MEASUREMENT 4A: CAPACITANCE VERSUS FREQUENCY

Instrument: Hewlett-Packard 4192A (Capacitance Transfer Standard)
Technique: Verified capacitance vs. frequency using H-P 4192A Impedance Analyzer (Transfer Standard), with model 16047A input fixture and interface cabling. Values correlated against EESTOR Reference Capacitance Board.

Measured Values:

FREQUENCY (Hz):	100	80	60	30	20	10	6
CAPACITANCE:	70.3nF	108.2nF	188.2nF	681nF	1.45uF	5.3uF	19.4uF

MEASUREMENT 4B: RESISTANCE MEASUREMENT

Instrument: Alpha Lab High Resistance Meter (Resistance Transfer Standard) & Caddock 10 Giga Ohm resistors calibrated 21 May 2013 by Tescom.
Technique: Verified using high resistance meter; which was verified using set of Caddock 10 Giga Ohm resistors calibrated by Tescom.

Measured Value: 259 KilOhms

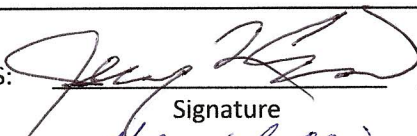
MEASUREMENT 4C: THICKNESS MEASUREMENT

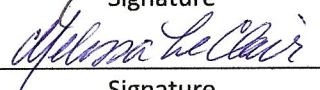
Instrument: Keyence model 260-248-8030 Thickness Meter Serial Number: 92017014 Calibrated by Tescom 26 June 2013 Due 26 June 2014
Technique: Zero thickness meter on stainless steel substrate. Place intermediate metal plate (measured thickness: 26.8 microns) to minimize zeroing error. Then and reference sample of copper substrate (same as copper backing on reference samples (measured thickness: 36.8 microns) – to be mathematically subtracted from calculated value. Copper reference is removed (intermediate metal plate remains). Layer is inserted and measured. The layer contains a copper backing of equal thickness to above copper reference. The sum value of the copper sample and metal plate are subtracted to derive actual measured thickness of LAYER sample.

Measured Value: 81.8 microns (actual/corrected)

CERTIFICATE NOTES:

Measurements were performed at the customer site using material samples owned and controlled by the customer. Those material samples were contained in clear plastic sample cases with dates written on cases. Samples were identified per customer by date written by customer on each case. Tescom does not make any claims regarding the material samples; only to measurement methods used as described in this certificate report. Use of term “Transfer Standard” refers to the accepted NIST traceable practice of making a primary measurement with one measurement instrument; then directly extrapolating those measured values for use in a second measurement, which then also becomes NIST traceable through the Transfer.

OBSERVER/WITNESS:  Jerry L. Eldred 10-1-13
Signature Printed Name Date

REVIEWED/APPROVED:  MELISSA LECCLAIR 10-1-13
Signature Printed Name Date