

INTERNATIONAL CENTRE FOR AUTOMOTIVE TECHNOLOGY

[A Division of NATRiP Implementation Society (NATIS), Govt. of India]

TEST REPORT

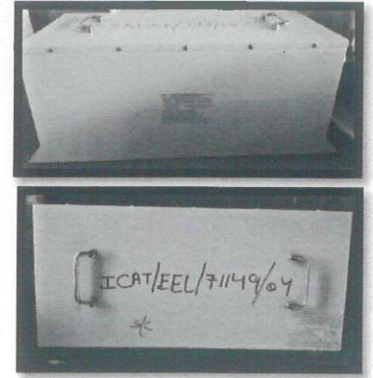
Non-Transferable

ULR No.: TC536020010000001P
Test Report No.: C T 0 B P 5 0 0 1

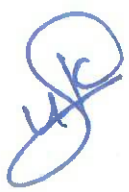


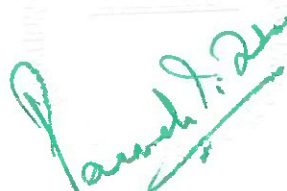

Date: 07.01.2020

- 1.0 **NAME AND ADDRESS OF THE CUSTOMER:** M/s. Okaya Power Private Limited
D-7, Udyog Nagar Peeragarhi Udyog
New Delhi -110041, INDIA
- 1.1 **NAME AND ADDRESS OF THE MANUFACTURER:** Same as Sr. No. 1.0
- 2.0 **CUSTOMER LETTER REF :** IOCS No. CCTNOKYAOJEEL71149 Dated 01-Aug-2019
- 3.0 **DESCRIPTION OF DEVICE UNDER TEST (DUT):**

DUT Name	Battery Pack, 51.2 V
Battery Type	Lithium Ion Battery
Battery Capacity(Ah)	160 Ah (Ah in 5 hrs)
Rated Voltage	51.2 V DC
Id/Model No.	LF51160E
Quantity	02 Nos. of Battery Pack & 04 Nos. of Cells (ICAT/EEL/71149/01-06)
Trade Name	OKAYA
Drawing No.	OPG--002-0619-0006
Configuration of Cells	16S2P






- 4.0 **DATE OF RECEIPT OF SAMPLE :** 04.11.2019
- 5.0 **CONDITION OF SAMPLE:** No physical damage observed.
- 6.0 **TEST OBJECTIVE:**
To validate the Safety Requirements of Traction Battery as per AIS:048 as amended upto date.
- 7.0 **TEST METHOD:** Test method referred from AIS:048 as amended upto date.
- 8.0 **FUNCTIONAL VERIFICATION:** Functional verification done and battery was found satisfactory.
- 9.0 **ANY DEVIATION OR EXCLUSION FROM TEST MEHOD:** Not Applicable.
- 10.0 **CONCLUSION:** The battery specified in Sr.No.3.0 of this test report met all the test requirements when tested as per AIS:048 as amended upto date as mentioned in Annexure-I of this report.
- 11.0 **TEST DESCRIPTION:** Please refer the Annexure-I of this report.
- 12.0 **DATE OF PERFORMANCE OF TEST:** Please refer the Annexure-I of this report.
- 13.0 **LOCATION OF TEST:** ICAT CENTRE-I
- 14.0 **TEST RESULTS:** Please refer the Test requirements and Results in Annexure-I of this report.

Prepared By	Checked By		Approved By	
				
UDIT KAUL Dy. Manager	MAHENDAR PAL Asst. General Manager		PAMELA TIKKU Sr. General Manager	BP5001

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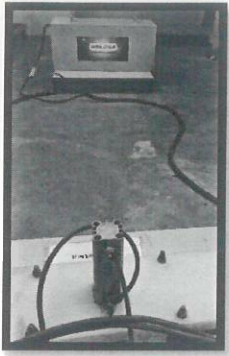
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UDIT KAUL Dy. Manager		MAHENDAR PAL Asst. General Manager	

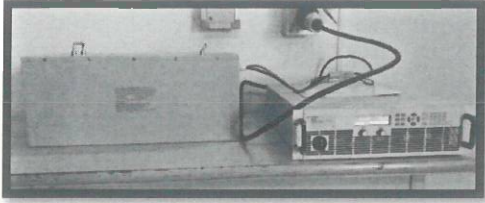
Annexure-I

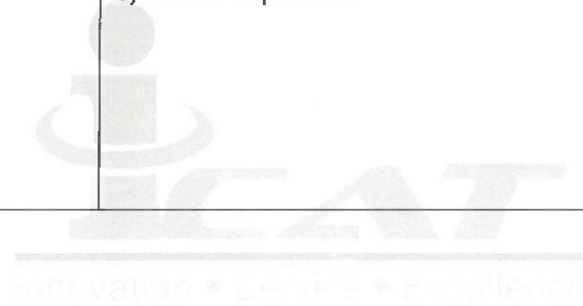
1.0 TEST REQUIREMENTS AND RESULTS:




Cl. No.	Test	Test Description	Observations/Results
2.1 Electrical Tests			
2.1.1	<p>Short Circuit test (Test ID:ICAT/ EEL /71149/01) Date of Test : 16.12.2019</p>	 <p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature. Apply a hard short in less than one second to the battery module with a conductor specified in the standard. Test Duration: 10 minutes, or until another condition occurs which prevents completion of test (i.e. component melting, etc.) Lab temperature: Not exceeding 30°C Acceptance Criteria: After 2 hours of observation: At the end of the test, there shall be no: a) Physical damage to the casing or mechanical parts. b) Melting of components. c) Fire or explosion. It is acceptable for the battery to become dry at the end of the test.</p>	<p>Ambient temperature : 27°C</p> <p>Conductor of $\leq 5m\Omega$ was used and short was applied for 10 minutes.</p> <p>No physical damage, explosion or melting observed.</p> <p>Satisfactory.</p>

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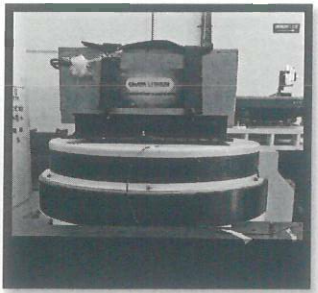





2.1.2	<p>Over Charge test (Test ID:ICAT/ EEL /71149/03) Date of Test : 16.12.2019</p>	 <p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature at 27±5°C. Duration: 10 hours The battery is to be overcharged at a constant charging current of 0.1 (C₁₀). Acceptance Criteria: At the end of the test, there shall be no: a) Physical damage to the casing or other mechanical parts. b) Melting of components. c) Fire or explosion.</p>	<p>Battery Cell was charged with 17.7 A for 10 hours.</p> <p>No physical damage, melting or explosion observed.</p> <p>Satisfactory.</p>
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2.2 Mechanical Tests




2.2.1	<p>Vibration test (Test ID:ICAT/ EEL /71149/02) Date of test : 20.12.2019</p>	 <p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature, firmly held on the vibration table in vehicle mounting position. Axis: Vertical and Horizontal axis, with battery positioned in longitudinal direction. Acceleration: 3 g (sinusoidal vibration) Frequency: 30-150 Hz Sweep rate: 1 octave per minute Duration: 2 hours in each axis Immediately after the test, discharge the battery at room temperature not exceeding 30°C, at the rate of I = 0.2 x Battery capacity(C₅)</p> <p>Acceptance Criteria: During test, there shall be no electrolyte loss. The deterioration of battery rated capacity during discharging shall not be more than 10%. At the end of the test, there shall be no: a) Physical damage to the casing or other mechanical parts. b) Fire or explosion</p>	<p>No electrolyte loss observed during test. Immediately after the test, battery was discharged at 32 A And deterioration observed was not more than 10%.</p> <p>No physical damage or explosion observed.</p> <p>Satisfactory.</p>
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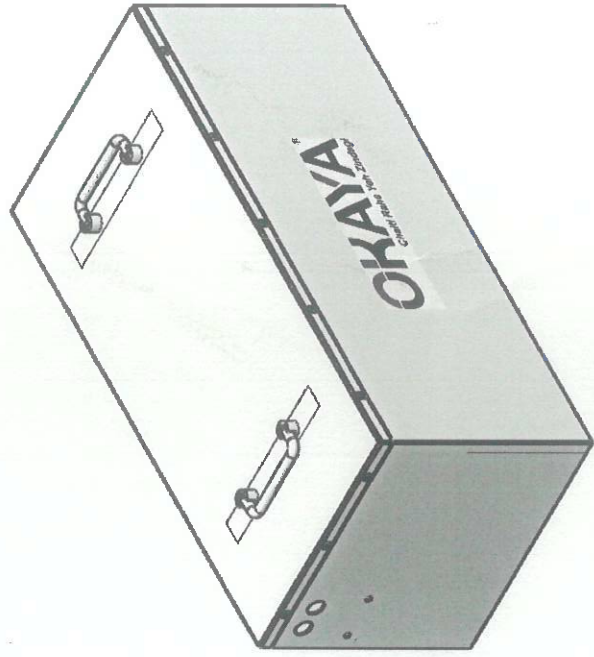
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<p>2.2.2</p>	<p>Shock test (Test ID: ICAT/ EEL /71149/02) Date of test: 20.12.2019</p>	<div style="text-align: center;">  </div> <p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature not exceeding 30°C, firmly held on the vibration table in vehicle mounting position. Axis: Vertical and Horizontal axis, with battery positioned in longitudinal direction. Acceleration: 30 g (half-sine wave) No. of shocks: 10 in each axis Duration: 15 ms of each shock Immediately after the test, discharge the battery at room temperature, at the rate of $I = 0.2 \times \text{Battery capacity}(C_5)$ Acceptance Criteria: The deterioration of battery rated capacity during discharging shall not be more than 10%. At the end of the test, there shall be no: a) Physical damage to the casing or other mechanical parts b) Fire or explosion.</p>	<p>Immediately after the test, battery was discharged at 32 A and deterioration observed was not more than 10%.</p> <p>No physical damage or explosion observed.</p> <p>Satisfactory.</p>
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<p>Prepared By</p> <div style="text-align: center;">  </div> <p>UDIT KAUL Dy. Manager</p>	<div style="text-align: center;">  </div>	<p>Checked By</p> <div style="text-align: center;">  </div> <p>MAHENDAR PAL Asst. General Manager</p>	<p>Page 06 of 07 + Dwg(01) [71149]</p>
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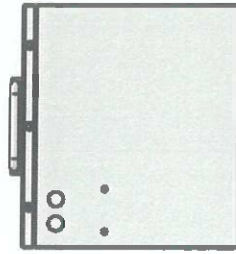
2.2.3	Roll-Over Test	<p>Rotate the battery module one complete revolution in one direction, for one minute in a continuous, slow-roll fashion, and observe leakage, if any. Then rotate the battery module in 90° increments in same direction for one full revolution. Hold the battery module for one hour at each position.</p> <p>Acceptance Criteria: The volume of electrolyte spilled in each position shall not be more than 25 ml per module.</p>	Not Applicable
2.2.4	<p>Penetration Test (Test ID: ICAT/ EEL /71149/04) Date of test 16.12.2019</p>	<div style="text-align: center;">  </div> <p>The battery Cell shall be penetrated with a mild steel (conductive) pointed rod, which will be electrically insulated from the test fixture. Rate of penetration: 8 cm/s. Diameter of Rod: 3mm Orientation of penetration: perpendicular to the electrode plates. Minimum Depth of penetration: Through three cells or 100 mm The battery Cell should be observed, with the rod remaining in place, for a minimum of one hour after the test.</p> <p>Acceptance Criteria: At the end of the test, there shall be no: a) Melting of components. b) Fire or explosion.</p>	<p>After penetration, up to a depth through cell with a pointed mild steel rod of diameter 3mm, electrically insulated from the test fixture, no explosion, no fire and no melting observed.</p> <p>Satisfactory.</p>

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ISOMETRIC VIEW

TRADE NAM - OKAYA
 MODEL NO - LF51160E
 CAPACITY IN 5hr - 160AH
 CELL CONF. - 16S 2P
 CELL CPACITY - 3.2V 80AH
 TYPE BATTERY - LiFePo4



SIDE VIEW



TOP VIEW



FRONT VIEW



OKAYA
NEVER STOP INDIA

**OKAYA POWER GROUP D-7 UDYOG NAGAR
 PEERAGARHI NEW DELHI-110041**

TITLE :- GAD OF 51.2V/160Ah LITHIUM BATTERY

CONFIGURATION NAME :- ASSEMBLY

CLIENT :- ALL

MATERIAL CRCA SHEET THICKNESS QTY. 01 Nos.

SCALE :- NTS DWG.No./PART NO :- OPG-002-0619-0006

DESIGN	NAME	DATE	SIGN.
DRAWN	A.R		
CHKD.	A.R		
APPD.	P.S		
APPD.	P.S		

SHEET No. :- 01 OF 01 REV. 0

SHEET SIZE A3

PLEASE DO NOT SCALE THE DRAWING, IF IN DOUBT, ASK.

DIMENSION	0-10	11-50	51-120	121-500	501-1000	1001-2000	2001-3150	>3150
FABRICATION (REF. IT 16)	±0.36	±1.2	±1.4	±2.8	±3.6	±6.0	±8.6	±0.3%
MACHINING (REF. IT 12)	±0.15	±0.3	±0.35	±0.7	±0.9	±1.5	±2.1	±0.1%
Grade	VVVV	VVV	VV	∇				
Ra	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2
µm	12.5	25	50	100	200	400	800	1600

TYPE OF CHANGE	NAME	DATE

ALL SHARP EDGE SHOULD BE REMOVED.
 # ALL DIMENSIONS ARE IN mm.

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