

# INTERNATIONAL CENTRE FOR AUTOMOTIVE TECHNOLOGY

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

## TEST REPORT

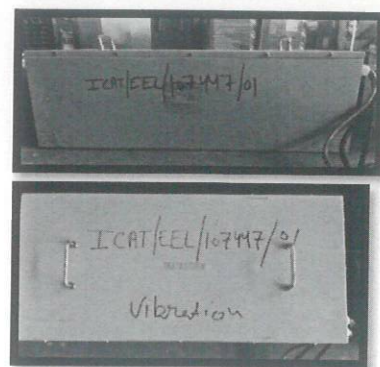
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ULR No.: TC536020040000091P  
Test Report No.: C T O G P 8 1 7 1




Date: 13.08.2020

- 1.0 NAME AND ADDRESS OF THE CUSTOMER : M/s. Okaya Power Private Limited  
H-19, Udyog Nagar Rohtak Road Udyog Nagar-110041  
New Delhi INDIA
- 1.1 NAME AND ADDRESS OF THE MANUFACTURER : Same as serial no. 1.0
- 2.0 CUSTOMER LETTER REF : IOCS No. CCTNOKYAPHEEL107447 Dated 16-June-2020
- 3.0 DESCRIPTION OF DEVICE UNDER TEST (DUT):

DUT Name	Battery Module, 51.2 V
Battery Type	Lithium Ion Battery (LiFePo4)
Battery Capacity(Ah)	240 Ah (Ah in 5 hrs)
Rated Voltage	51.2 V DC
Model No.	LFP51240E
Quantity	02 No. of Battery Module & 04 Nos. of Cells (ICAT/EEL/107447/01-06)
Trade Name	OKAYA
Drawing No.	OPG-002-0720-0021
Configuration of Cells	16S3P



- 4.0 DATE OF RECEIPT OF SAMPLE : 20.07.2020
- 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 ANY DEVIATION FROM TEST METHOD: No
- 9.0 FUNCTIONAL VERIFICATION: Functional verification done and battery was found satisfactory.
- 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



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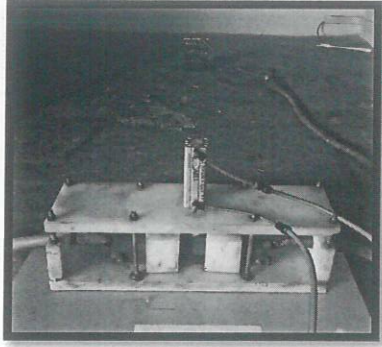
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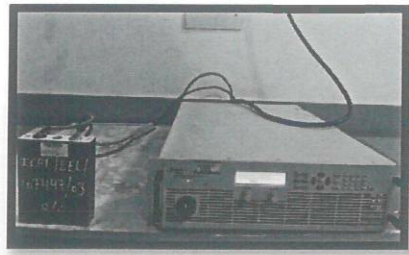
Annexure-I

1.0 TEST REQUIREMENTS AND RESULTS:




Cl. No.	Test	Test Description	Observations/Results
<b>2.1 Electrical Tests</b>			
2.1.1	<p><b>Short Circuit test</b>                      (Test ID:ICAT/                      EEL /107447/04)                      Date of Test :                      05.08.2020</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  <b>Acceptance Criteria:</b>                      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 <math>\leq 5m\Omega</math> was used and short was applied for 10 minutes.</p> <p>No physical damage, explosion or melting observed.</p> <p><b>Satisfactory.</b></p>

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<p>2.1.2</p>	<p><b>Over Charge test</b>                  (Test ID:ICAT/                  EEL /107447/01)                  Date of Test :                  28.07.2020</p>	 <p>Battery Condition: Fully charged (100% SOC),                  contained at ambient temperature at 27±5°C.                  Duration: 10 hours                  The cell is to be overcharged at a constant charging                  current of 0.1 (C<sub>10</sub>).  <b>Acceptance Criteria:</b>                  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 explosn.</p>	<p>Battery cell                  was charged                  with                  8 A for 10                  hours.</p> <p>No physical                  damage,                  melting or                  explosion                  observed.</p> <p><b>Satisfactory.</b></p>
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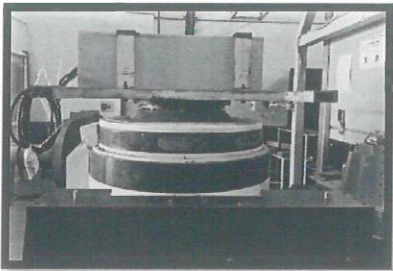
<p>Prepared By</p>  <p><b>UDIT KAUL</b>                  Dy. Manager</p>		<p>Checked By</p>  <p><b>MAHENDAR PAL</b>                  Asst. General Manager</p>	<p>Page                  04 of 07                  +                  Dwg(01)                  [107447]</p>
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2.2 Mechanical Tests




2.2.1	<p><b>Vibration test</b>                  (Test ID:ICAT/                  EEL /107447/02)                  Date of test :                  30.07.2020</p>		<p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature, firmly held on the vibration table in vehicle mounting position. Vibration test will be carried out in three-axis viz. in the vertical axis, horizontal axis and 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(C<sub>5</sub>)</p> <p><b>Acceptance Criteria:</b>                  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 48 A And deterioration observed was not more than 10%.</p> <p>No physical damage or explosion observed.</p> <p><b>Satisfactory.</b></p>
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2.2.2	<p><b>Shock test</b>                  (Test ID: ICAT/                  EEL /107447/03)                  Date of test :                  30.07.2020</p>	 <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.                  Shock test will be carried out in three-axis viz. in the vertical axis, horizontal axis and 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 <math>I = 0.2 \times \text{Battery capacity}(C_5)</math>  <b>Acceptance Criteria:</b>                  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 48 A and deterioration observed was not more than 10%.</p> <p>No physical damage or explosion observed.</p> <p><b>Satisfactory.</b></p>
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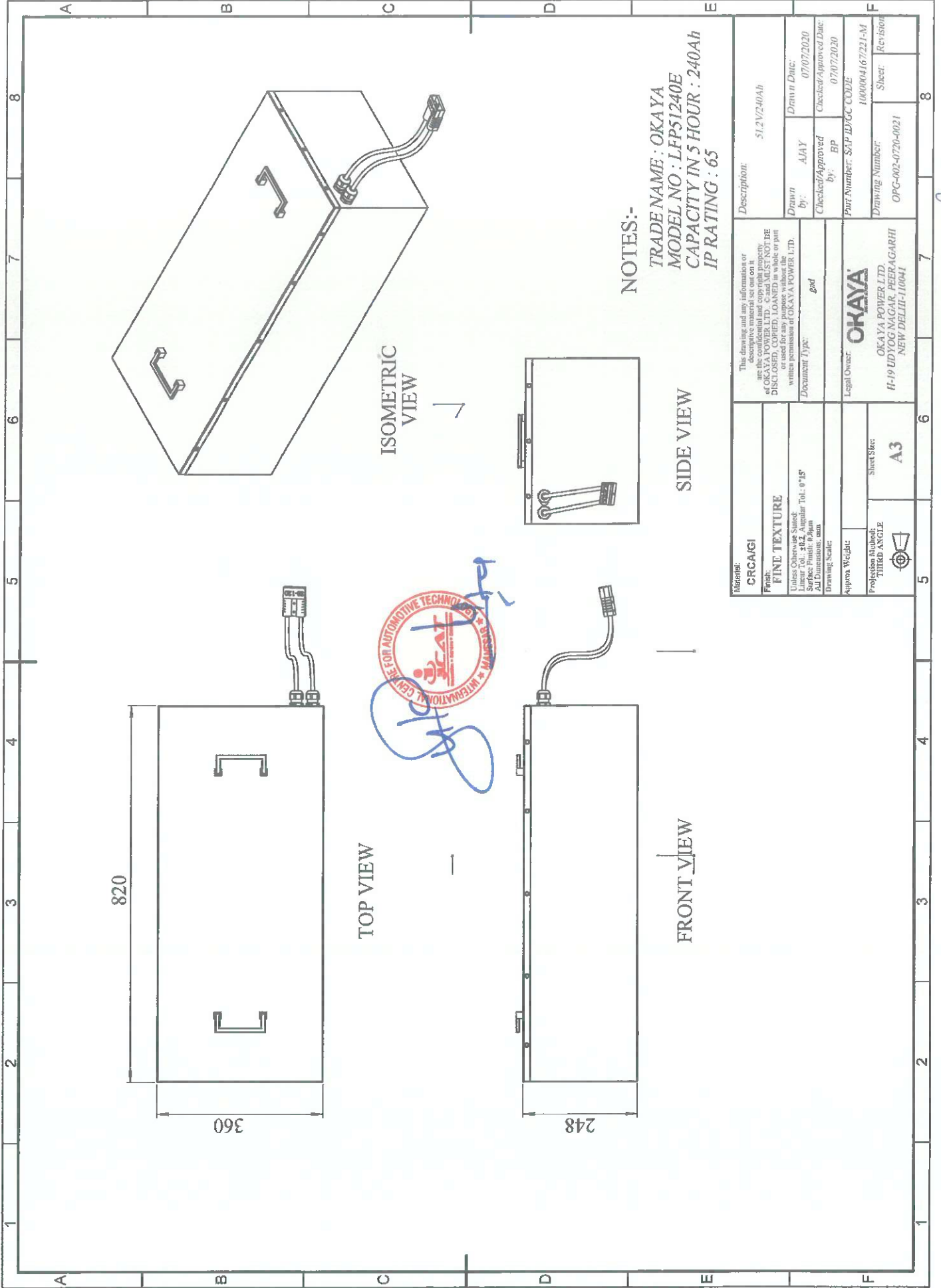
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2.2.3	Roll-Over Test	<p>Rotate the battery module one complete revolution in one direction, for one minute in a continuous, slow-roll fashion, and observe leakage, if any.                  Then rotate the battery module in 90° increments in same direction for one full revolution. Hold the battery module for one hour at each position.  <b>Acceptance Criteria:</b>                  The volume of electrolyte spilled in each position shall not be more than 25 ml per module.</p>	Not Applicable
2.2.4	Penetration Test	<p>The battery Cell shall be penetrated with a mild steel (conductive) pointed rod, which will be electrically insulated from the test fixture. The test will be carried out with 100% SOC of the Battery cell/Battery module.                  Rate of penetration: <b>8 cm/s.</b>                  Diameter of Rod: <b>3mm</b>                  Orientation of penetration: <b>perpendicular to the electrode plates.</b>                  Minimum Depth of penetration: <b>Through three cells or 100 mm</b>                  The battery Cell should be observed, with the rod remaining in place, for a minimum of one hour after the test.  <b>Acceptance Criteria:</b>                  At the end of the test, there shall be no:                  a) Melting of components.                  b) Fire or explosion..</p>	Refer Test Report No.CT0B05305

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Test Report No: CTDUMPB171

Date: 13.08.2020



NOTES:-

TRADE NAME : OKAYA  
 MODEL NO : LFP51240E  
 CAPACITY IN 5 HOUR : 240Ah  
 IP RATING : 65

Material: CRCA/GI		Description: 51.2V/240Ah	
Finish: FINE TEXTURE		Drawn By: AJAY	Drawn Date: 07/07/2020
Unless Otherwise Stated: Linear Tol.: ±0.2, Angular Tol.: 0°15' Surface Finish: 0.8µm Zn/D, minimum 10µm		Checked/Approved By: BP	Checked/Approved Date: 07/07/2020
Drawing Scale:		Part Number: S&P ID/DC CODE	
Approx Weight:	Legal Owner: OKAYA	Drawing Number: 1000094167221-M	
Projection Method: THIRD ANGLE	Sheet Size: A3	Revision:	
Sheet Size: A3		Drawing Number: OPG-002-0720-0021	