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INTERNATIONAL CENTRE FOR AUTOMOTIVE TECHNOLOGY

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

Non-Transferable

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TEST REPORT

Test Report No.: C T 0 B N 5 3 0 3 | **Date: 25.10.2018**

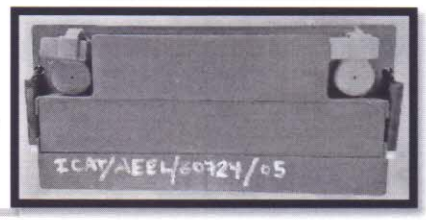
1.0 NAME AND ADDRESS OF THE CUSTOMER: **M/s. Okaya Power Pvt. Limited,** D7, Udyog Nagar, Rohtak Road, New Delhi-110041

1.1 NAME AND ADDRESS OF THE MANUFACTURER: **M/s. Fujikawa Power** Vill. Handa Kundi, Tehsil Nalagarh,Distt. Solan, Himachal Pradesh

2.0 CUSTOMER LETTER REF : IOCS No. CCTNOKYANGEEG60724 Dated 12-Jun-2018

3.0 DESCRIPTION OF DEVICE UNDER TEST (DUT):

DUT Name	: Battery Module, 12 V
Battery Type	: Lead Acid Battery
Battery Capacity(Ah)	: 115Ah (Ah in 5 hrs)
Rated Voltage	: 12 Volt DC
Id/Model No.	: OW ER 1400 PLUS
Quantity	: 06 Nos. (ICAT/AEEL /60724/01-06)
Trade Name	: Okaya
Drawing No.	: DW-860-00



4.0 DATE OF RECEIPT OF SAMPLE : 26.09.2018

5.0 CONDITION OF SAMPLE : No Physical Damage observed

6.0 TEST OBJECTIVE:
To validate the Safety Requirements of Traction Batteries as per **AIS: 048 amended up to date**

7.0 TEST METHOD: Test method referred from AIS: 048 as amended up to date.

8.0 FUNCTIONAL VERIFICATION: Functional verification done and battery was found satisfactory

9.0 CONCLUSION:
The battery specified in **Sr. No.** 3.0 of this test report met all the test requirements when tested as per **AIS: 048 amended up to date** as mentioned in Annexure No. 1 of this report.

10.0 TEST DISCRIPTION: Please refer the Annexure No. 1 of this report.

11.0 DATE OF PERFORMANCE OF TEST: Please refer the Annexure No. 1 of this report.

12.0 TEST RESULTS:
Please refer the Test requirements and Results in **Annexure-I** of this report.

Prepared By	Checked By		Approved By	
UDIT KAUL	MAHENDAR PAL		PAMELA TIKKU	Page 1 of 7 + Dwg (01) [60724]
Asst. Manager	Asst. General Manager		Sr. General Manager	

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(An ISO 9001, ISO 14001 and OHSAS 18001 certified, scope wise NABL accredited and BIS recognised Test House)

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Prepared By		Checked By	
UDIT KAUL Asst. Manager	INTERNATIONAL CENTRE FOR AUTOMOTIVE TECHNOLOGY ★ MANESAR ★	MAHENDAR PAL Asst. General Manager	Page 2 of 7 + Dwg(01) [60724]

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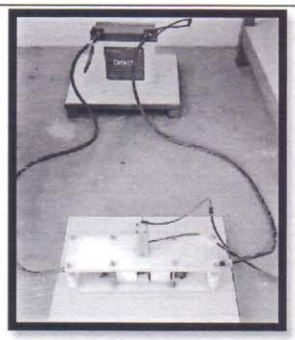
Annexure – I

1.0 TEST REQUIREMENTS AND RESULTS:

Cl. No.	Test	Test Description	Observations/Results
2.1 Electrical Tests			
2.1.1	**Short Circuit test** **(Test ID:ICAT/AEEL/60724/01)** Date of Test : 01.10.2018	 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.	Ambient temperature : 25°C Conductor of ≤ 5mΩ was used and short was applied for 10 minutes. No physical damage, explosion or melting observed. **Satisfactory.**

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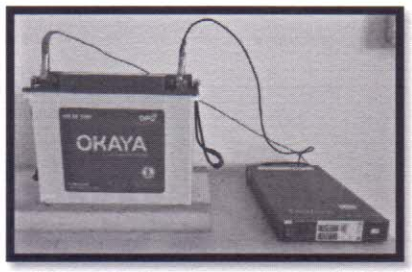
2.1.2	**Over Charge test** **(Test ID:ICAT/ AEEL/60724/02)** Date of Test : 01.10.2018	 Battery Condition: Fully charged (100% SOC), contained at ambient temperature at 27±5°C. Duration: 10 hours The battery is to be overcharged at a constant charging current of 0.1 (C_{10}). **Acceptance Criteria:** 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.	Battery Module was charged with 12.77 A for 10 hours. No physical damage, melting or explosion observed. **Satisfactory.**

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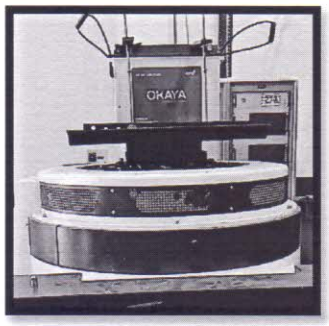
2.2 Mechanical Tests

2.2.1	**Vibration test** **(Test ID: ICAT/ AEEL/60724/03)** Date of test : 08.10.2018	 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^{O}C, at the rate of I = 0.2 x Battery capacity(C_5) **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	No electrolyte loss observed during test. Immediately after the test, battery was discharged at 23 A And deterioration observed was not more than 10%. No physical damage or explosion observed. **Satisfactory.**

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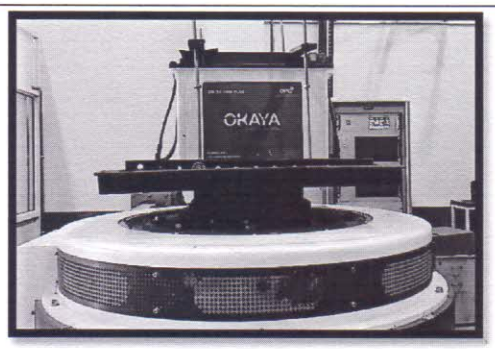
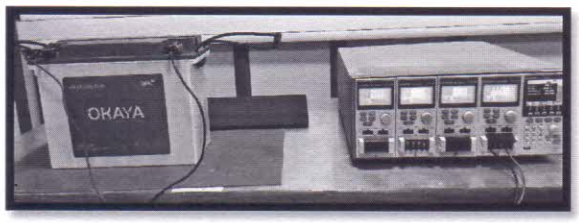
2.2.2	**Shock test** **(Test ID: ICAT/AEEL/60724/04)** Date of test : 08.10.2018	  Battery Condition: Fully charged (100% SOC), contained at ambient temperature not exceeding 30^0C, firmly held on the vibration table in vehicle mounting position. Axis: Vertical and Horizontal axis, with battery positioned 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 x 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.	Immediately after the test, battery was discharged at 23 A and deterioration observed was not more than 10%. No physical damage or explosion observed. **Satisfactory.**

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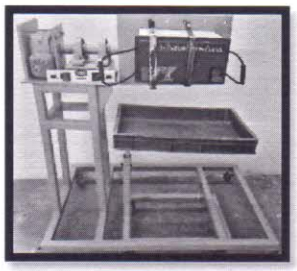
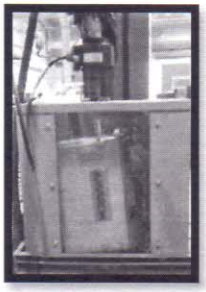
2.2.3	**Roll-Over Test** **(Test ID: ICAT/AEEL/60724/05)** Date of test : 01.10.2018	 Rotate the battery module one complete revolution in one direction, for one minute in a continuous, slow-roll fashion, and observe leakage, if any. Then rotate the battery module in 90° increments in same direction for one full revolution. Hold the battery module for one hour at each position. **Acceptance Criteria:** The volume of electrolyte spilled in each position shall not be more than 25 ml per module.	Spillage observed was less than 25ml in each position. **Satisfactory.**
2.2.4	**Penetration Test** **(Test ID: ICAT/AEEL/60724/05)** Date of test : 10.10.2018	 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: **20mm** 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. **Acceptance Criteria:** At the end of the test, there shall be no: a) Melting of components. b) Fire or explosion.	After penetration, up to a depth through cell with a pointed mild steel rod of diameter 20mm, electrically insulated from the test fixture, no explosion, no fire and no melting observed. **Satisfactory.**