

# INTERNATIONAL CENTRE FOR AUTOMOTIVE TECHNOLOGY

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

Non-Transferable

## TEST REPORT

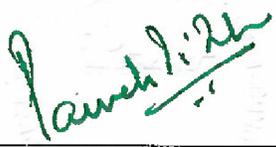
C T O B M 5 2 8 6

Date: 22.09.2017

- 1.0 **NAME AND ADDRESS OF THE: CUSTOMER** M/s. EASTMAN AUTO & POWER LIMITED  
Khasra No. 315/252/1-4 Nalagarh Pinjore Highway  
Nalagarh District Solan (H.P.) 174101, India
- 2.0 **NAME AND ADDRESS OF THE: MANUFACTURER** Same as Sr. No. 1.0
- 3.0 **CUSTOMER LETTER REF:** IOCS No. CCTNEAPLMHEEG53396 Dated 19-Jul-2017
- 4.0 **DESCRIPTION OF DEVICE UNDER TEST (DUT):**  
 DUT Name : Battery Module, 12 V  
 Battery Type : Lead Acid Battery  
 Battery Capacity(Ah) : 90 Ah (Ah in 5 hrs)  
 Id/Model No. : EM 1206ER  
 Quantity : 06 Nos. (ICAT/CNG-LPG/53396/01-06)  
 Trade Name : Eastman  
 Drawing No. : EAP-ER-40-0249



- 5.0 **OBJECTIVE OF THE TEST:**  
To validate the Safety Requirements of Traction Batteries as per AIS: 048 amended up to date
- 6.0 **TEST RESULTS:**  
Please refer the Test requirements and Results in Annexure-I of this report.
- 7.0 **CONCLUSION:**  
The battery specified in Sr. No. 4.0 of this test report met all the test requirements when tested as per AIS: 048 amended up to date.

Prepared By	Checked By		Approved By	 Page 1 of 7 + Dwg (01) [53396]
 UDIT KAUL Asst. Manager	 MAHENDAR PAL Sr. Manager		 PAMELA TIKKU Sr. General Manager	

**DISCLAIMER**

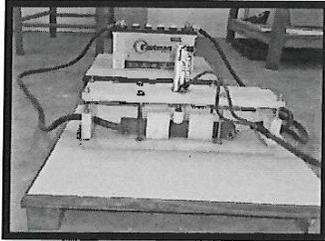
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10. The appropriate local court at Gurgaon shall have the jurisdiction in respect of any dispute, claim or liability arising out of this report.

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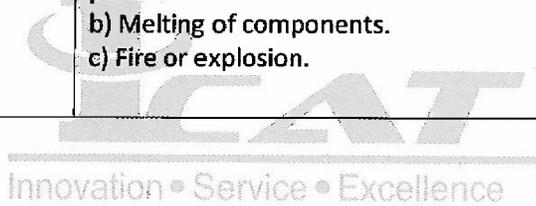
Annexure – I

1.0 TEST REQUIREMENTS AND RESULTS:

Cl. No.	Test	Test Requirements	Observations/Results
<b>2.1 Electrical Tests</b>			
2.1.1	<p><b>Short Circuit test</b> (Test ID: ICAT/CNG-LPG/53396/01)</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 : 28°C</p> <p>Conductor of ≤ 5mΩ was used and short was applied for 10 minutes.</p> <p>No physical damage, explosion or melting observed.</p> <p><b>Satisfactory.</b></p>

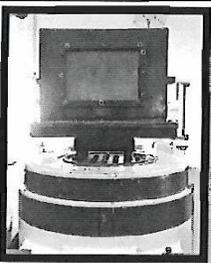
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<p>2.1.2</p>	<p><b>Over Charge test</b> (Test ID:ICAT/ CNG-LPG/53396/02)</p>	 <p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature at <math>27\pm 5^{\circ}\text{C}</math>. Duration: 10 hours The battery is to be overcharged at a constant charging current of 0.1 (<math>C_{10}</math>).</p> <p><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 explosion.</p>	<p>Battery was charged with 10 A for 10 hours.</p> <p>No physical damage, melting or explosion observed.</p> <p><b>Satisfactory.</b></p>
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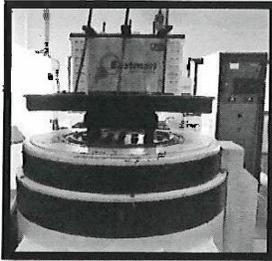


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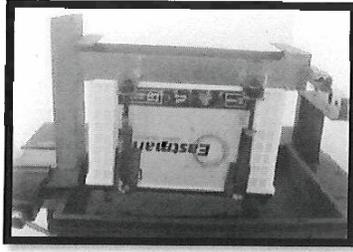
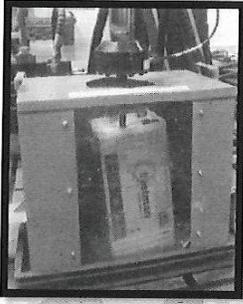
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2.2 Mechanical Tests			
2.2.1	<b>Vibration test</b> (Test ID: ICAT/ CNG- LPG/53396/03)	 <p>Battery Condition: Fully charged (100% SOC), contained at ambient temperature, firmly held on the vibration table in vehicle mounting position.                      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 <math>I = 0.2 \times \text{Battery capacity}(C_5)</math></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.</p> <p>Immediately after the test, battery was discharged at 18 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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<p>2.2.2</p>	<p><b>Shock test</b> (Test ID: ICAT/CNG-LPG/53396/04)</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.</p> <p>Axis: Vertical and Horizontal axis, with battery positioned in longitudinal direction.</p> <p>Acceleration: 30 g (half-sine wave)</p> <p>No. of shocks: 10 in each axis</p> <p>Duration: 15 ms of each shock</p> <p>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></p> <p><b>Acceptance Criteria:</b></p> <p>The deterioration of battery rated capacity during discharging shall not be more than 10%. At the end of the test, there shall be no:</p> <ol style="list-style-type: none"> <li>Physical damage to the casing or other mechanical parts</li> <li>Fire or explosion.</li> </ol>	<p>Immediately after the test, battery was discharged at 18A 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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<p>2.2.3</p>	<p><b>Roll-Over Test (Battery Module)</b> (Test ID: ICAT/CNG-LPG/53396/05)</p>	 <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>	<p>Spillage observed was less than 25ml in each position. <b>Satisfactory.</b></p>
<p>2.2.4</p>	<p><b>Penetration Test</b> (Test ID: ICAT/CNG-LPG/53396/06)</p>	 <p>The battery module shall be penetrated with a mild steel (conductive) pointed rod, which will be electrically insulated from the test fixture. <b>Rate of penetration: 8 cm/s.</b> <b>Diameter of Rod: 20mm</b> <b>Orientation of penetration: perpendicular to the electrode plates.</b> <b>Minimum Depth of penetration: Through three cells or 100 mm</b> The battery 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>	<p>After penetration, up to a depth through three cells with a pointed mild steel rod of diameter 20mm, electrically insulated from the test fixture, no explosion, no fire and no melting observed. <b>Satisfactory.</b></p>

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