

राष्ट्रीय मोटर वाहन परीक्षण ट्रैक (राष्ट्रीय मोटर वाहन बोर्ड, भारी उद्योग मंत्रालय, भारत सरकार के अंतर्गत)

NATIONAL AUTOMOTIVE TEST TRACKS

(Under National Automotive Board, Ministry of Heavy Industries, Government of India)

N B-Li 0044 Dated: 06-11-2023

TEST REPORT

1.0	NAME AND ADDRESS OF THE CUSTOMER	M/s AMBIT TRANSMISSION PRODUCTS PVT.LTD. B-5, IIE SIGADDI GROWTH CENTRE, SIDCUL, KOTDWARA, PAURI GARHWAL, UTTARAKHAND-246149 (INDIA)
1.1	NAME AND ADDRESS OF THE MANUFACTURER	M/s AMBIT TRANSMISSION PRODUCTS PVT.LTD. B-5, IIE SIGADDI GROWTH CENTRE, SIDCUL, KOTDWARA, PAURI GARHWAL, UTTARAKHAND-246149 (INDIA)
2.0	TESTING REFERENCE LETTER No.	001, Dated:- 27.09.2023

3.0	DESCRIPTION OF	DEVICE UNDER	TEST (DUT):	
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S.No	Particulars	Description
ì	DUT NAME	REESS
ii	Trade Mark	9AP
iii	Battery Type	Li-ion (NMC)
iv	Battery Pack Capacity (Ah)	28.6Ah
V	Operating Voltage	47.6V-72.25V
vi	Rated Voltage	61.2V
vii	Battery Pack Id/Model	9APNC61.2V28.6Ah
viii	Battery Dimensions (I*b*h)	210mm*220mm*200mm
ix	Battery Weight In (Kg)	14.8Kg
Х	Battery Module Drawing no.	AMBITDDN9APIK072301
xi	Battery Pack Sr. no.	9APZ1F30230900036







SERIAL NUMBER - 9APZ1F30230900036 BLUETOOTH NUMBER - A4C13752BF4F

TRADE NAME - 9AP BATTERY MODEL - 9APNC61.2V28.6AH CELL CHEMISTRY- NMC CELL RATING - 3.6V/2600mAh BMS SPECIFICATION - 17S 60A
BMS MODEL - 9AP MANUFACTURING - SEPTEMBER 2023

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Authorized Signatory:	
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PREPARED BY **CHECKED BY**

Rishikesh Sharma Manish Mandloi Engineer Sr. Engineer

NATRAX CASE ID: NATRAX/TB/23-24/48 Format no. NATRAX/TB/L/2023/01

APPROVED BY



Page 01 of 27

Umesh Raghuwanshi Asst. Manager

कार्यालयः आगरा – मुम्बई मार्ग (एन.एच. 52), पिथमपुर फ्लाईओवर के आगे, पोस्ट—खण्डवा (पिथमपुर के पास), जिला—धार –454774 (म.प्र.) Office: Agra – Mumbai Highway (NH – 52), Next to Pithampur Flyover,

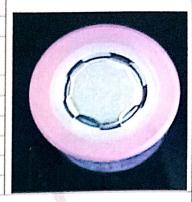
Post- Khandwa (Near Pithampur), Dist. Dhar (M.P.) – 454774, Web: www.natrax.in

मुख्य कार्यालयः दूसरी मंजिल, प्रशासनिक भवन, आईकेट परिसर -।।, सेक्टर – 11, आई. एम. टी. मानेसर, गुरुग्राम, हरियाणा – 122051 Corporate Office: 2nd Floor, Administrative Building, ICAT Campus-II, Sector-11, IMT Manesar, Gurugram, Haryana - 122051 Tel: 01246 900 000, Website: www.natrip.in

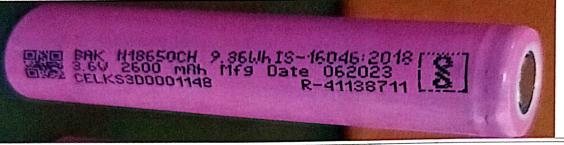
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4	Cell	Description
i	Cell Manufacture Name	ZHENGZHOU BAK BATTERY CO. LTD
ii	Cell Chemistry, Form Factor & Dimensions	CYLINDRICAL,L-65±0.2MM , Ø- 18.3±0.15MM
iii	Cell Voltage & Capacity	3.6V, 2.6Ah
iv	Cell Voltage Range	2.5V - 4.25V
V	Cell Model No.	N18650CH
vi	Cell Batch Code No.	R-41138711
vii	Configuration of cells	17S11P
viii	Cell Type	NMC
ix	Cell certification report/Date	IEC/22100704 / 07/11/2022



CELL РНОТО



5	BMS	Description		
ı	BMS Make	AMBIT TRANSMISSION PRODUCTS PVT.LTD		
li	BMS Model/ ID No.	9AP		
lii	lii BMS Software version/ Hardware version 52/9APN17S60A			
iv	BMS Communication Protocol	UART & 485 & CAN		
V	BMS EMC Test Report (referred)	CT0MS0738, 19.10.2023		

BMS PHOTO



9APN17S60A LI-lon 3.7V UART&485&CAN Common Port with Balance PN: 17160006 SN129241722

Remarks: Refer page 27 of 27 for Disclaimer		NA	TRAX CASE ID: NATRAX/TB/23-24/48
Authorized Signatory:		Page 02 of 27	Format no. NATRAX/TB/L/2023/01
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Rishikesh Sharma	Manish Mandloi		Umesh Raghuwanshi
Engineer	Sr. Engineer		Asst. Manager

NT Dated: 06-11-2023 0 B-Li 0044



6	Battery Charger	Description		
i	Charger Sr. no.	230940002		
ii	Charger (External/On Board)	External		
iii	Charger Make / Model	RAPIDTRON/ RE2AC6010		
iv	Trade Name of Charger	RAPIDTRON		
V	Charger Type	CAN based Lithium ion charger		
CHARGER PHOTO	RAPIDIRON CHARGES DESCRIPTION CHARGES DESCRIPTION	EV-BATTERY CHARGER MODEL NO: (RELACE O TO BATTERY TYPE : Li-lon Recharges bio Batteries INPUT VOLTAGE : 170V-300VIAC, 474842 INPUT CURRENT : [0.0 A ± 0.3 A] MAX OUTPUT UVACTAGE : [1-4/2 0-1/2/2] MAX OUTPUT VOLTAGE : [1-4/2 0-1/2/2] FIRMYARE NUMBER : [1-4/2 0-1/2/2] WWW.rapidition.co.in		

	Construction and the second second	www.rapidtron.co.in #be in the 1	
7	Sample Receipt date	eipt date 05-10-2023	
8	Removable/ Fixed Removable Battery		
9	Condition of Sample	Good (No physical damage observed)	
10	Test Objective	To validate the safety requirements with respect to the Rechargeable	
		Electrical Energy Storage System (REESS) of L category vehicle as per the	
		requirements of AIS-156(Part II) 2022 amendment 3 Phase 2.	
11	Functional	Functional verification done and REESS was found satisfactory	
	Verification		
12	Test Method	Test method referred from AIS-156(Part II) 2022 amendment 3 Phase 2.	
13	Test Description and	tion and Please refer the ANNEXURE-1 of this report	
	date of Performance		
14	Conclusion	The REESS specified in Sr. No. 3.0 of this test report met all the test	
	À	requirements when tested as per AIS-156(Part II) 2022 amendment 3	
		Phase 2 as mentioned in Annexure-1 of this report.	
15	Test Results	Please refer the test requirements and results in ANNEXURE-I of this report	
16	Test Location	EV Test Lab, NATRAX	
17	Test Sample applicabi	lity on vehicle models: L1, L2 (2-Wheelers)	
18	Total No. of Pages	27 (Report with Annexures) + 1 (Drawings)	

Remarks: Refer page 27 of 27 for Disclaimer		NATRAX CASE ID: NATRAX/TB/23-24/48		
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Rishikesh Sharma	Manish Mandloi		Umesh Raghuwanshi	
Engineer	Sr. Engineer		Asst. Manager	



1.0 TEST REQUIREMENTS AND RESULTS:

1.1	Vibration Test Reference Standard: AIS 156(Part II)-2022 (A3P2)					
1.1.1						
	Particulars	and the control of the last the field of the state of the	Parameter During Test			
	Test Component	REESS Subsyst	em (Battery Pack)			
	Ambient temperature (20 ± 10°C)	27 °C				
	Test Component SOC (>50%)	90 %				
H	Protection Devices of DUT	Fuse				
9	Test Axis	Z-Axis (Vertica	l Axis)			
1/48	Test Component Weight	14.8 Kg				
-24	Frequency Type	Sinusoidal				
/23	Frequency Sweep	7 Hz to 200 Hz	to 7 Hz Frequency [Hz] 7-18			
/TB		Frequency [Hz]				
AX,		7-18	10			
Sample ID: NATRAX/TB/23-24/48-01	For Weight 12Kg or More	18 -	Gradually increased from 10 to 20			
ž		approximately				
9		25				
ple		25 - 200	20			
am	Frequency Sweep Time 15 Minutes					
01	Total Frequency Sweep	12				
	Test Duration	3 Hours				
	Observation duration after Standard Cycle					
	Test Start Date 18.10.2023					
	Test End Date 18.10.					
1.1.2	Test Result					
	Requirement	Observations				
	During the test, there shall be no evidence of	 No Electrolyte leakage, no rupture, no fire and no explosion. 				
	(a) Electrolyte leakage	and no e	xpiosion.			
	(b) Rupture c) Fire (d) Explosion	Standard	Standard cycle was feasible after test.			
	Standard cycle		resistance was found greater than			
	The isolation resistance measured after test		$=$ 100 Ω /Volt.			

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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer

S 0044 Dated: 06-11-2023 T B-Li N



ANNEXURE-1

1.1.3

Vibration Test Setup (Photo)

Test Report

Report time: Oct-19-2023 14:05:48 Test name: <u>liTHIUM_Battery</u> Vibration test -Test status: Test Stopped (Schedule Finished)

Data measured at: Oct-18-2023 14:50:12 Test type: VCS (Swept Sine) Run folder: VIBRATION TEST-0114 Oct 18, 2023 11-53-08

Testing time Remaining Time: 00:00:00

Run Start Time: Oct-18-2023 11:53:22

Total elapsed time: 03:00:12

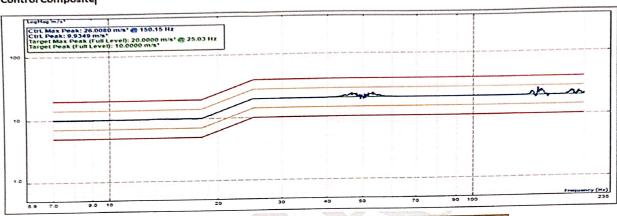
Full level elapsed time: 03:00:00

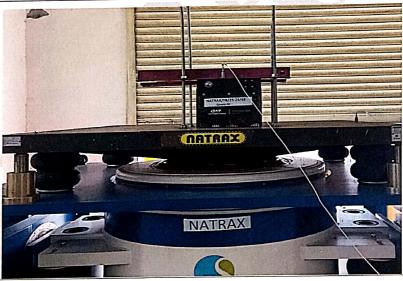
Test parameters Current Frequency: 7,000 Hz Signal Plot Points: 2048

Sweeping Rate: 0.64487 Oct/Min Sweep Type: Logarithmic

Sweep Number: 24

Control Composite





Format no. NATRAX/TB/L/2023/01 Remarks: Refer page 27 of 27 for Disclaimer **Checked By Prepared By** OMOTIL Page 05 of 27 Manish Mandloi Rishikesh Sharma Sr. Engineer Engineer



1.2	•	lechanical Drop Test Indard: AIS 156(Part II)-2022 (A3P2)
1.2.1	Procedure	
	Particulars	Parameter During Test
**	Test Component	REESS Subsystem (Battery Pack)
9	Ambient temperature (20 ± 10°C)	26 °C
/48	Test Component SOC (≥90%)	90 %
-24	Protection Devices of DUT	Fuse
Sample ID: NATRAX/TB/23-24/48-03	Test Component Weight	14.8 Kg
/TB	Height of the free fall for REESS	1 m
AX/	Total no. of Drop (Free fall)	6 (Battery has 6 Faces)
TR	DUT Free fall orientation	Each surface facing floor
Š	Type of surface	Horizontal concrete pad
<u>:</u>	Test Duration	3 Hours
ple	Observation duration after	1 Hour
am	Standard Cycle	
Š	Test Start Date	17.10.2023
	Test End Date	17.10.2023

1.2.2	Test Result			
	Requirement	All I	101.15	Observations
	During the test, there sh	all be no evi	dence of:	No Electrolyte leakage, no rupture, no fire
	(a) Electrolyte leakage		The state of the s	and no explosion.
	(b) Rupture c) Fire (d) E	xplosion		
	Standard cycle		The same	Standard cycle was feasible after test.
	The isolation resistance	measured	after th	lsolation resistance was found greater than
	test.			100Ω/Volt.

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Engineer			Sr. Engineer

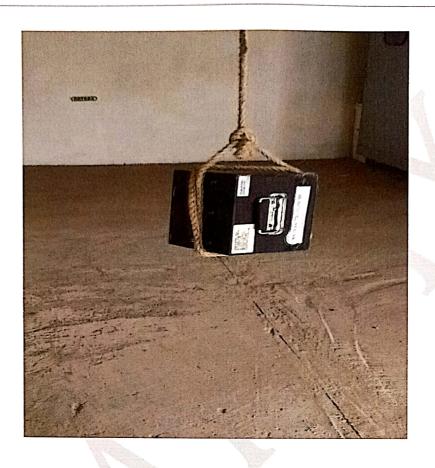
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ANNEXURE-1

1.2.3

Mechanical Drop Test Setup (Photo)



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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer



1.3	Mechanical Shock Reference Standard: AIS 156(Part II)-2022 (A3P2)			
1.3.1	Procedure			
	Particulars	Parameter During Test		
	Test Component	REESS Subsystem (Battery Pack)		
25	Ambient temperature (20 ± 10°C)	26 °C		
3	Test Component SOC (>50%)	90 %		
4/0	Protection Devices of DUT	Fuse		
Sample ID: NATRAX/TB/23-24/48-02	Test Axis	X-Axis (Linear Axis), Y-Axis (Lateral Axis) and Z-Axis (Vertical Axis)		
/TE	Test Component Weight	14.8 Kg		
RA)	Frequency Type	Half-Sine		
ATI	Peak Acceleration	500 m/s ²		
Z	Pulse Duration	11 milliseconds		
ple ID	Total Shock	18 (3 shocks in the positive direction followed by 3 shocks in the negative direction in all 3 axis)		
Sam	Observation duration after	1 Hour		
0,	Standard Cycle			
	Test Start Date	13.10.2023		
	Test End Date	13.10.2023		

1.3.2	Test Result	
	Requirement During the test, there shall be no evidence	Observations No Electrolyte leakage, no rupture, no fire
	of: (a) Electrolyte leakage,	and no explosion.
	(b) Rupture, c) Fire, (d) Explosion Standard cycle	Standard cycle was feasible after test.
	The isolation resistance measured after the test.	Isolation resistance was found greater than $100\Omega/V$ olt.

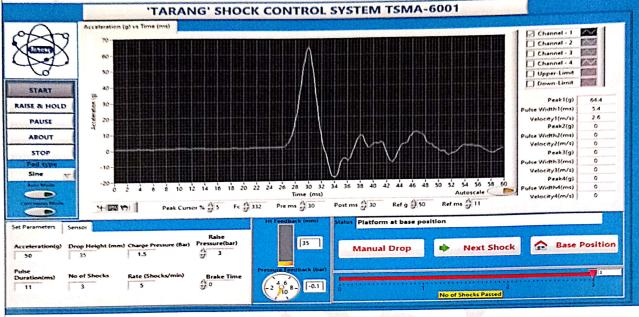
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Engineer	mag_00=10		Sr. Engineer

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ANNEXURE-1

Mechanical Shock Test Setup (Photo) 1.3.3







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Rishikesh Sharma			Manish Mandloi
Engineer	1		Sr. Engineer

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2.1		Shock & Cycling Test d: AIS 156(Part II)-2022 (A3P2)		
2.1.1	Procedure			
	Particulars	Parameter During Test		
	Test Component	REESS Subsystem (Battery Pack)		
-	Ambient temperature (20 ± 10°C)	27 °C		
70-5	Test Component SOC (>50%)	80 %		
/48	Protection Devices of DUT	Fuse		
-24	Positive Set Temperature	60 °C		
/23	Positive Temperature Duration	6 Hours		
AX/TB,	Time taken to reach Negative Set Temperature	20 Minutes		
TR/	Negative Set Temperature	-40°C		
NA	Negative Temperature Duration	6 Hours		
;	Time taken to reach Positive Set	20 Minutes		
Test Component SOC (>50%) Protection Devices of DUT Positive Set Temperature Positive Temperature Duration Time taken to reach Negative Set Temperature Negative Set Temperature Negative Temperature Negative Temperature Negative Temperature Negative Temperature Duration Time taken to reach Positive Set Temperature No of Cycles				
		5		
Ś	Storage Time	24 Hours after test		
	Test Start Date	10.10.2023		
	Test End Date	16.10.2023		

2.1.2	Test Result	₩
	Requirement	Observations
	During the test, there shall be no evidence	No Electrolyte leakage, no rupture, no fire
	of:	and no explosion.
	(a) Electrolyte leakage	
	(b) Rupture c) Fire (d) Explosion	
	Standard cycle	Standard cycle was feasible after test.
4	The isolation resistance measured after the	Isolation resistance was found greater than
	test.	100Ω/Volt.

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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer

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ANNEXURE-1

2.1.3

Thermal Shock & Cycling Test Setup (Photo)





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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer



3.1	Fire Resistance Test Reference Standard: AIS 156(Part II)-2022 (A3P2)				
3.1.1	Procedure				
	General Parameter				
	Particulars	Parameter During Test			
	Test Component	REESS Subsystem (Battery Pack)			
	Ambient temperature (> 0°C)	26 °C			
	Test Component SOC (>50%)	80 %			
	Protection Devices of DUT	Fuse			
	Fuel Temperature	Less than 20°C			
	Test Fixture Parameter				
	Particulars	Parameters During Test			
01	Grating Table steel rods diameter (Eqvl.)	6-10 mm			
-84	Distance between Grating Table steel rods	4-6 Cm			
24/	Fuel	Petrol			
Sample ID: NATRAX/TB/23-24/48-01	Fuel Pan Dimension	L- 450mm, B- 350mm, H- 80mm			
18/3	Fuel Level from Pan Top	< 8 cm			
×	Distance between Fuel Level and DUT	50 cm			
RA	Fixed Component	Fuel Pan			
Ι¥	Movable Component	DUT Fixture			
	Screen Height from Fuel Level	3 cm			
<u>e</u>	Length and Width of the screen	2 to 4 cm smaller than Pan			
ш	Screen Material (Brick)	SK 30			
Sa	Test Lab Ventilation	Yes (Indoor with Ventilation)			
	Test Parameter	T.			
	Particulars	Parameter During Test			
	Fuel Pan distance from DUT	3 m			
	Pre-Heating Duration (Phase-A)	60 s			
	Duration of DUT direct Exposure to Flame (Phase-B)	70 s			
	Duration of DUT direct Exposure to Flame (Phase-C)	60 s			
	Observation Time	3 Hours			
	Test End Date	17.10.2023			
	Test End Date	17.10.2023			

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Engineer			Sr. Engineer

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3.1.2	Test Result	
	Requirement	Observation
	No explosion at end of test.	No explosion observed.

Test Setup 3.1.3





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ANNEXURE-1 PROTECTION VARIFICATION

4.1		hort Circuit Protection ard: AIS 156(Part II)-2022 (A3P2)
4.1.1	Procedure	
	Particulars	Parameters During Test
35	Test Component	REESS Subsystem (Battery Pack)
)-81	Battery Management System	Available
7/4/	Ambient temperature (20 ± 10°C)	27 °C
3-2	Test Component SOC (>50%)	80 %
B/2	Protection Devices of DUT	Fuse
5	DUT Condition	Active Mode
Sample ID: NATRAX/TB/23-24/48-05	Test Component Weight	14.8 Kg
1AT	Connector resistance	< 5 mΩ
	Test Stopped when	REESS's operated and interrupted the short circuit.
e II	Observation duration after Standard	1 Hour
ldπ	Cycle	
Sar	Test Start Date	16.10.2023
	Test End Date	16.10.2023

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Engineer			Sr. Engineer

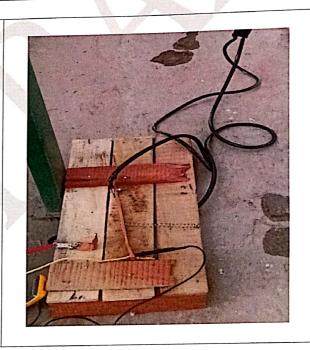
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4.1.2	Test Result	
	Requirement	Observations
	During the test, there shall be no evidence of: (a) Electrolyte leakage	No Electrolyte leakage, no rupture, no fire and no explosion.
	(b) Rupture c) Fire (d) Explosion	REESS's operated and interrupted the
	External Short Circuit Protection	short circuit as soon as the current crossed the upper limit set in the Battery Management System
	Standard cycle	Standard cycle was feasible after test
	The tested battery was kept in observation	Normal Functionality was observed.
	for 1 hour	Isolation resistance was found greate
	The isolation resistance measured after the test.	than $100\Omega/\text{Volt}$.

Test Setup 4.1.3





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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer



4.2	Over-Charge Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)					
4.2.1	Procedure					
	Particulars	Parameter During Test				
	Test Component	REESS Subsystem (Battery Pack)				
05	Battery Management System	Available				
200	Ambient temperature (20 ± 10°C)	26 °C				
24/	Protection Devices of DUT	Fuse				
e II	DUT Condition	Active Mode				
Sample ID: X/TB/23-24	Charging Current	10 A				
Sample ID: NATRAX/TB/23-24/48-02	Test Stopped when	The charging continued until the tested-device (automatically) interrupts or limits the charging				
NA.	Observation Period	1 Hour				
	Test Start Date	13.10.2023				
	Test End Date	13.10.2023				

4.2.2	Test Result	The second secon
	Requirement	Observations
	During the test, there shall be no evidence of: (a) Electrolyte leakage (b) Rupture c) Fire (d) Explosion	No Electrolyte leakage, no rupture, no fire and no explosion.
	Over-charge Protection	Automatic Interruption
	Standard cycle	Standard cycle was feasible after test.
	The tested battery was kept in observation for 1 hour	Normal Functionality was observed.
	The isolation resistance measured after the test.	Isolation resistance was found greater than $100\Omega/\text{Volt}.$

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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer

Dated: 06-11-2023 0 B-Li 0044



4	.2.3	Test Setup								
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1	Test Name:	Over Charge Propa			A STATE OF THE PARTY AND ADDRESS OF THE PARTY	Control of the State of the Sta	ALLES AND THE SECTION OF THE SECTION			
MANNE	Test Date:	13-10-2023 14:20								
	Operator ID:	The second second								
	Program Nan									
5	Program Des									
6		a C:\VisuaLCN\Progr	ram	s\NATRAX	.mdb					
7	Module Type		T	- 1						
8		r LCV 100-80								
9	Address:	Port: 1, Sys Contro	ller	: 3 Circuit:	7					
Rethres	Name:	Port 1, Ctr Device								
11	1 Tollies									
WASHING	Exclude	Total Time Cycle		Current, A	Voltage, V	Power, W	Amp-Hour	Watt-Hou l	Jser Varia U	ser Varia O
4aciltohin	No	00:01.0	1	10	70.39	703	0	0.1		0
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March Pa	No	00:03.0	1	10	70.43	704	0	0.5	0	0
Historia	-	00:04.0	1	10	70.44	704	0.01	0.7	0	0
Archerin	No	00:05.0	1	10	70.45	704	0.01	0.9	0	0
Secretary	No	00:06.0	1	10	70.46	704	0.01	1.1	0	0
WINDS NO.	No	00:07.0	1	10	70.48	704	0.01	1.3	0	0
20	all and a second	00:08.0	1	10	70.49	704	0.02	1.5	0	0
21	and a second	00:09.0	1	10	70.5	704	0.02	1.7	0	0
900000	No	00:10.0	1	10	70.51	705	0.02	1.9	0	0
Accesses	No	00:11.0	1	10	70.51	705	0.03	2.1	0	0
Spirelebel	No.	06:34.0	1	10	71.88	718	1.09	77.8 78	0	0
107	7 No	06:35.0	1	10	71.88	718	1.09	78.2	0	0
08	No.	06:36.0	1	9.99	71.89	718	1.09	78.2 78.4	0	0
09	No	06:37.0	1	10	71.89	718	1.1	78.4 78.6	0	0
110	No	06:38.0	1	10	71.89	718	1.1	78.8	0	0
11	No	06:39.0	1	10	71.9	719	1.1	78.8 78.8	0	0
1.7	No	06:40.0	1	-0.01	79.98	0	1.1	78.8	0	0
	No	06:41.0 ver Charge Prop	1	-0.01	80.4	0	1.1	/6.0		3

Remarks: Refer page 27 of 27 for Discl	aimer		Format no. NATRAX/TB/L/2023/01
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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer



4.3	Over-Discharge Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)						
4.3.1	Procedure						
	Particulars	Parameter During Test					
	Test Component	REESS Subsystem (Battery Pack)					
-02	Battery Management System	Available					
48	Ambient temperature (20 \pm 10°C)	27 °C					
ID: -24/	Protection Devices of DUT	Fuse					
le 1 23-	DUT Condition	Active Mode					
Sample X/TB/23	Discharging Current	18 A					
Sample ID: NATRAX/TB/23-24/48-02	Test Stopped when	The discharging continued until the tested-device (automatically) interrupts or limits the discharging.					
NA	Observation Period	1 Hour					
	Test Start Date	16.10.2023					
	Test End Date	16.10.2023					

4.3.2	Test Result	March 1887
	Requirement	Observations
	During the test, there shall be no evidence of: (a) Electrolyte leakage (b) Rupture c) Fire (d) Explosion	No Electrolyte leakage, no rupture, no fire and no explosion.
	Over-discharge Protection	Interrupted the discharging current.
	Standard cycle	Standard cycle was feasible after test.
	The tested battery was kept in observation for 1 hour	Normal Functionality was observed.
	The isolation resistance measured after the test.	Isolation resistance was found greater than $100\Omega/Volt$.

Remarks: Refer page 27 of 27 for Disclain	ner		Format no. NATRAX/TB/L/2023/01
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Engineer			Sr. Engineer

B-Li 0044 Dated: 06-11-2023 N T



4.3.	3 Tes	st Setup		Des Anguio d'Assessation (Caracheste)						
atte s	H	D			1	, .	L	IVI	14	<u> </u>
1	Test Name:	Over Disch	arge Prop	agation An	nbi48	3 2000 3 2000 3 2000 3 2000				
2	Test Date:	16-10-20			The second secon					
3	Operator ID:	Admin			The second second second				Anna and the second sec	
4	Program Nam	e Dis-charge	and would be a seed and 1 Me Ph.	The same of the sa						
MANAGE SPREAM AND A	Program Desc	Company of the second		347 m				and the same of th		
	Program Data		N\Program	ms\NATRA	X.mdb			and the second		
7	Module Type:									
8	Module Descr	ir LCV 100-8	0							
9	Address:	Port: 1, Sy	s Controlle	er: 3 Circui	t: 3					
10	Name:	Port 1, Ctr								
11					A Supposed Comment of the Comment			teternal P	Amo-Hour \	Natt-Hou
12	Exclude	Total Time	Cycle			Power, W	Constant	Internal R	0	-0.2
13	No	00:01.0	1				3.35	0	0	-0.5
14	No	00:02.0	1			-1083	3.34 3.34	0	-0.01	-0.8
15	No	00:03.0	1				3.34	0	-0.01	-1.1
16	No	00:04.0	1	And the second s		-1082	3.34	0	-0.02	-1.4
17	No	00:05.0	1		60.14	-1082 -1082	3.34	0	-0.02	-1.7
18	No	00:06.0	1		60.12	-1082	3.34	0	-0.03	-2
19	No	00:07.0	1		60.11	-1081	3.34	0	-0.03	-2.3
20	No	0.80:00	1	The second secon	60.1 60.08	-1081	3.34	0	-0.04	-2.6
21	No	00:09.0	1		60.08	-1081	3.34	0	-0.04	-2.9
22	No	00:10.0	1		60.06	-1081	3.34	0	-0.05	-3.2
23	No	00:11.0	1		49.28	-887	2.74	0	-7.55	-433.7
523		25:11.0	1		49.28	-885	2.73	0	-7.55	-433.9
1524	and the same of th	25:12.0	1 1		49.13	-884	2.73	0	-7.56	-434.2
1525	and the same of th	25:13.0	1	-18	49.15	-882	2.73	0	-7.56	-434.4
1526	A STATE OF THE PARTY OF THE PAR	25:14.0	1	-18	48.97	-881	2.72	0	-7.57	-434.7
1527		25:15.0	1	-0.01	-13.35	0	440.44	0	-7.57	-434.8
1528	The state of the s	25:16.0	1	-0.01	-11.07	0	203.29	0	-7.57	-434.8
529 530	Name and Address of the Owner, where the Parket of the Par	25:17.0 25:18.0	1	-0.01	-9.03	0	653.18	0	-7.57	-434.8

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Rishikesh Sharma			Manish Mandloi
Engineer	1		Sr. Engineer



4.4	Over-Temperature Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)					
4.4.1	Procedure					
e continue y a contract contract con all a l'allegation and	Particulars	Parameter During Test				
	Test Component	REESS Subsystem (Battery Pack)				
90	Temperature Sensor	On Board				
48	Battery Management System	Available				
24/	Protection Devices of DUT	Fuse				
23-	Chamber Temperature	60°C				
./8/	DUT Condition	Active Mode				
Ş	Charging Current	10 A				
TR.	Discharging Current	18 A				
Sample ID: NATRAX/TB/23-24/48-04	Test Stopped when	Battery inhibits and/or limits the charge and/or discharge to prevent the temperature increase (Auto Cut-off)				
a B	Observation Period	1 Hour				
O1	Test Start Date	13.10.2023				
	Test End Date	13.10.2023				

4.4.2	Test Result	
	Requirement	Observations
	During the test, there shall be no evidence of: (a) Electrolyte leakage (b) Rupture c) Fire (d) Explosion	No Electrolyte leakage, no rupture, no fire and no explosion.
	Over-temperature Protection	Inhibited and limits the charge to prevent the temperature increase, when battery temperature reached 54.24°C.
	The isolation resistance measured after the test.	Isolation resistance was found greater than $100\Omega/\text{Volt}$.

Remarks: Refer page 27 of 27 for Discl	aimer		Format no. NATRAX/TB/L/2023/01
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Rishikesh Sharma			Manish Mandloi
Engineer			Sr. Engineer



4.5		Propagation S 156(Part II)-2022 (A3P2)			
4.5.1	Procedure				
	Particulars	Parameter During Test			
	Test Component	REESS Subsystem (Battery Pack)			
	Battery Management System	Operational			
	Potation devices SOC	Not Applicable			
	Test Component SOC	95 %			
	Trigger Method	Over Charge			
α	Initiation cell temperature	22°C			
1/48-0	Maximum temperature (define by the manufacturer)	60°C			
3-77	DUT Condition	OK			
Sample ID; NATRAX/TB/23-24/48-03	Thermal runaway condition (i) The measured voltage of the initiation cell drops: (ii) The measured temperature exceeds [the maximum operating temperature defined by the manufacturer] (iii) dT/dt≥ [1°C/s] of the measured temperature.	Thermal runaway not detected. Only condition (i) and (ii) wear met.			
	Thermal runaway can be judged when: (a) Both (i) and (iii) are detected: or (b) Both (ii) and (iii) are detected				
	Test Stopped when	Auto cut-off and Voltage exceeded 200%			
	Test Start Date	16.10.2023			
	Test End Date	16.10.2023			

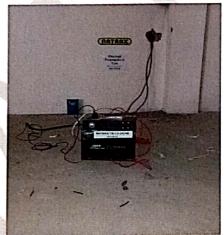
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Engineer			Sr. Engineer

B-Li 0044 Dated: 06-11-2023



4.5.2	Test Result	
	Requirement	Observations
	During the test, there shall be no evidence of:	No fire, No explosion observed during
and the second of the second of the second or the second of the second or the second of the second or the second o	(a) Fire. (b) Explosion.	test.

4 Program 5 Program 6 Program 7 Module 8 Module 9 Address 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 1407 No 1408 No 1409 No 1410 No	me: Tharmal Pro te: 16-10-2023 or ID: Admin n Nan 3.7V 16Ah n Dati C:\Visual.CN' 1 Type yd Desc LCV 100-80 E: Port: 1, Sys C Port 1, Cti De	12:35 Program: Controller evice ID:	Ambi-48 s\NATRAX.		Maria La	N	*	geografia V	
2 Test Data 3 Operato 4 Program 5 Program 7 Module 8 Module 9 Address 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 1407 No 1408 No 1409 No	me: Tharmal Pro te: 16-10-2023 or ID: Admin n Nan 3.7V 16Ah n Dati C:\Visual.CN' 1 Type yd Desc LCV 100-80 E: Port: 1, Sys C Port 1, Cti De	Programs Controller	Ambi-48 s\NATRAX.						
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4 Program 5 Program 6 Program 7 Module 8 Module 9 Address 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 1407 No 408 No 4409 No 4409 No	n Nan 3.7V 16Ah n Description: n Dati C:\VisuaLCN' Type yd Desc LCV 100-80 Port: 1, Sys C Port 1, Cti De	controller evice ID:	: 3 Circuit:						
5 Program 6 Program 7 Module 8 Module 8 Module 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 1407 No 1408 No 1409 No	n Description: n Data C:\VisualCN' Type yd Desc LCV 100-80 Port: 1, Sys C Port 1, Cti De	controller evice ID:	: 3 Circuit:						
6 Program 7 Module 8 Module 9 Address 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 1407 No 4408 No 4409 No 4410 No	n Dati C:\VisualCN' Typeyd Desc LCV 100-80 Port: 1, Sys C Port 1, Cti De	controller evice ID:	: 3 Circuit:						
7 Module 8 Module 9 Address 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 4409 No 4410 No	Type yd Desc LCV 100-80 Port: 1, Sys C Port 1, Cti De	controller evice ID:	: 3 Circuit:						
8 Module 9 Address 10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No	Port: 1, Sys C Port 1, Cti De Total TimiCy	vice ID:		4					
9 Address Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 401 No	Port: 1, Sys C Port 1, Cti De Total Timi Cy	vice ID:		4					
10 Name: 11 12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No	Port 1, Cti De	vice ID:		4					
11 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 4409 No 410 No	Total TimeCy								
12 Exclude 13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No		rda C							
13 No 14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No		cla C							Limeselane
14 No 15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No		CIE	urrent, AV	oltage, V Po	wer, W A	mp-Houi Ti	mperat 200	24.8	Onassigni
15 No 16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No	00:01.0	1	6	4.52	27	0	200	24.8	ő
16 No 17 No 18 No 19 No 407 No 408 No 409 No 410 No	00:02.0	1	6	4.53	27	0	200	24.8	ő
17 No 18 No 19 No 407 No 408 No 409 No 410 No	00:03.0	1	6	4.54	27	0	200	24.8	ő
18 No 19 No 407 No 408 No 409 No 410 No	00:04.0	1	5.99	4.54	27	o	200	24.8	o
19 No 407 No 408 No 409 No 410 No	00:05.0	1	6	4.54	27	0	200	24.8	o
407 No 408 No 409 No 410 No	00:06.0	1	6	4.55	27	0.01	200	24.8	0
408 No 409 No 410 No	00:07.0	1	6	4,55	27 33	7.32	29.4	61.9	0
409 No 410 No	13:15.0	1	6	5.5	32	7.32	29.4	62	0
410 No	13:16.0	1	6	5.5 5.5	32	7.32	29.4	62.1	0
Discovery Interior	13:17.0	1	6	5.5	33	7.32	29.4	62.2	o
	13:18.0	1	0.01	29.59	0	7.32	29.4	62.3	0
411 No 412 No	13:19.0 13:20.0	1	0.01	26.67	o	7.32	29.4	62.4	O
CONTRACTOR OF THE PARTY OF THE	13:21.0	1	0.01	23.94	o	7.32	29.4	62.5	O
413 No 414 No	13:21.0		0.01	20.94	o ·	7.32	29.4	62.6	0
414 140	13.22.0	-	0.01	10.54	-	and the same of th			
ALCOHOLD THE T	Thermal Donners	tion Am	hiar 43	Tally for all a process and a	A CONTRACTOR OF THE PARTY OF TH	STATISTICAL PROPERTY AND ADDRESS.	(4)		



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Engineer			Sr. Engineer

Dated: 06-11-2023 B-Li 0044



ANNEXURE-1 Water Ingress Protection Test

4.6 TEST REQIRMENTS AND RESULTS:

	IPX7
	Reference Standard: IEC 60529 AIS-156 A3 P2
The state of the s	Procedure
10	REESS with 100% SOC shall be tested:-
Sample ID: NATRAX/TB/23-24/48-06	The lowest point of enclosures with a height less than 850 mm is located 1000 mm below the surface of water. The highest point enclosures with a height equal to or greater than 850 mm is located 150 mm below the surface of the water Test Date: - 13-10-2023
<u>e</u>	Test duration: - 30 min
du	Acceptance Criteria: - There shall be no fire or explosion during testing of REESS.
Sar	Test Result: - At the end of the test, no fire and no explosion was observed from tested
	device.

4.6.1 **Test Setup**



Page 23 of 27 Marian M	Rishikesh Sharma			Manish Mandloi
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Sr.N	Cl. No.	Verification/Test Name	Date	Observation	Result
and place in responses fronting to Marco parts.	and the second s	5.0 Verifica	tions:		
5.1	6.1.2.1	BMS Shall be microprocessor/ microcontroller-based circuit	13.10.2023	Microcontroller Make: JBD	Complied
5.2	6.1.2.3 (a)	BMS over charge protection	13.10.2023	71.9V	Complied
5.3	6.1.2.3 (b)	BMS over discharge protection	16.10.2023	48.97V	Complied
5.4	6.1.2.3 (c)	BMS over temperature	13.10.2023	T charge= 55°C T discharge= 60°C	Complied
5.5	6.1.2.3 (d)	BMS over current protection	16.10.2023	Charge Current =21A Discharge Current = 41A	Complied
5.6	6.1.2.3 (e)	BMS Short circuit protection	16.10.2023	Verified	Complied
	6.1. 3(a)	Charger voltage cut off	13.10.2023	71.16V	Complied
5.7	6.1.3(b)	Soft start function	13.10.2023	Initial Current = 1.3 A Set Current = 10.6 A	Complied
5.9	6.1.3 (c)	Pre-charge function to detect over discharge	13.10.2023	Verified	Complied
5.10	6.1.3(d)	Input supply variation with battery pack	13.10.2023	Verified	Complied
5.11	6.1.3(f)	Communication verification with battery pack	13.10.2023	Verified	Complied
5.12	Annexure 8k-(3)	Verification of cell charge/discharge cycle data	16.10.2023	Verified	Complied
5.13	Annexure 8k-(7)	Verification of the cell to cell spacing in battery pack	13.10.2023	0.5mm	Complied
5.14	Annexure 8k-(8)	Verification of additional safety fuse/ circuit breaker	13.10.2023	Verified	Complied
5.15	Annexure 8k-(9)	Verification of the cells, BMS charger w.r.t serial number	13.10.2023	Verified	Complied

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Engineer			Sr. Engineer

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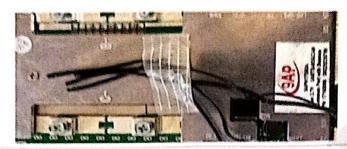


Sr.N	Cl. No.	Verification/Test Name	Date	Observation	Result
5.0 Ve	erifications:		kud. Kida puluannya midikiriko-kitirika didikira serbidasa Ciliride belakan munikidak di Asarimp		
5.16	Annexure 8k-(10)	Protection against regenerative	16.10.2023	BMS	Complied
5.17	6.1.2.2	BMS shall comply EMC requirements as per AIS 004 Part 3 or AIS 004 Part 33 Rev 1 as applicable at ESA level(test report Verification)	20.10.2023	Report no: CT0MS0738 19.10.2023	Complied
5.18	6.1.3(e)	Earth leakage detection	13.10.2023	Verified	Complied
5.19	Annexure 8k-(1)	Verification of manufacturing date on cell	13.10.2023	Verified	Complied
5.20	Annexure 8k-(2)	Cell report Verification as per IS 16893	20.10.2023	Report no: IEC/22100704, Dated:- 07/11/2022	Complied
5.21	Annexure 8k-(4)	Verification of pressure release vent	13.10.2023	Verified	Complied
5.22	Annexure 8k-(5)	Verification of temperature sensor	13.10.2023	Verified	Complied
5.23	Annexure 8k-(6)	Verification of action paralleling circuit in the battery pack	13.10.2023	Verified	Complied
5.24	Annexure 8k-(11)	BMS data logging	17.10.2023	Verified	Complied

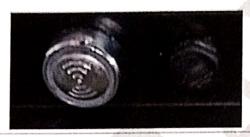
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Engineer			Sr. Engineer



Verification of Temperature Sensor



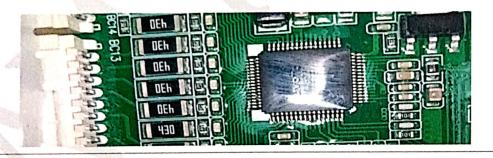
Verification of Pressure Release vent & Visual Alarm



Verification of Safety Fuse- 60A



Verification of Microcontroller-based circuit



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Rishikesh Sharma			Manish Mandloi
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1. NATRAX issues Test Reports/ Extension Reports/ Developmental Test Reports for Vehicles/ Components/ Parts/ Assemblies etc. based on the documents produced and/ or prototype/ vehicle (s) or sample (s) submitted by the applicant and testing thereof.

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7. Breach of any statutory provisions, of Indian Laws and Laws of any other countries, will be sole responsibility of the bearer of the Test Reports/ Extension Reports/ Developmental Test Reports is/ are issued and NATRAX shall not be liable for any claims or damages, whatsoever. The bearer shall alone be liable for the same and shall undertake to indemnify NATRAX in this regard.

 Further, NATRAX has the right, but not under obligation to initiate cancellation/ Withdrawal of the Test Reports/ Extension Reports/ Developmental Test Reports is/ are issued in case of any fraud, misrepresentation, when it surfaces and comes in the knowledge of.

Remarks: Refer page 27 of 27 for Disclai	mer	7.	Format no. NATRAX/TB/L/2023/01
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Page 27 of 27

