



NATIONAL AUTOMOTIVE TEST TRACKS

[Under NATIONAL AUTOMOTIVE BOARD (Ministry of Heavy Industries), Govt. of India]

N T O B-Li S 0023

Dated: 25-08-2023

TEST REPORT

1.0	NAME AND ADDRESS OF THE CUSTOMER	M/s PPAP Technology Limited B-45, Phase-II, Noida, Gautam Buddha Nagar, Uttar Pradesh, 201305
1.1	NAME AND ADDRESS OF THE MANUFACTURER	M/s PPAP Technology Limited B-45, Phase-II, Noida, Gautam Buddha Nagar, Uttar Pradesh, 201305
2.0	TESTING REFERENCE LETTER No.	Natrax/001/23-24, 20.06.2023

3.0 DESCRIPTION OF DEVICE UNDER TEST (DUT):

S.No	Particulars	Description
i	DUT NAME	REESS (Battery Pack)
ii	Trade Mark	MileageX
iii	Battery Type	Lithium-ion Battery Pack
iv	Battery Pack Capacity (Ah)	165 Ah
v	Operating Voltage	37.5V ~54.75V
vi	Rated Voltage	48 V
vii	Battery Pack Id/Model	48V165Ah
viii	Battery Dimensions (l*b*h)	410mm*360mm*324mm
ix	Battery Weight In (Kg)	62 Kg
x	Battery Module Drawing no.	PLTDN48165102208
xi	Battery Pack Sr. no.	PTNEV481657920FD0002



Remarks: Refer page 27 of 27 for Disclaimer

NATRAX CASE ID: NATRAX/TB/23-24/19

Authorized Signatory:

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Format no. NATRAX/TB/L/2023/01

PREPARED BY	CHECKED BY	NATIONAL AUTOMOTIVE TEST TRACKS NATRAX	APPROVED BY
Rishikesh Sharma Engineer	Manish Mandloi Sr. Engineer		Umesh Raghuwanshi Asst. Manager

NATIONAL AUTOMOTIVE TRACKS (NATRAX)

Agra-Mumbai Highway HN-52, Next to Pithampur Flyover, Village-Post Khandwa (Near Pithampur),
Distt. Dhar (M.P.)-454 774



4	Cell	Description
i	Cell Manufacture Name	Welson Power Technology (WUXI) Co., Ltd.
ii	Cell Chemistry, Form Factor & Dimensions	LFP, Prismatic & 48.8mm*173.9mm*166.8mm
iii	Cell Voltage & Capacity	3.2V, 165AH
iv	Cell Model No.	WSP-LFP48173166-165Ah
v	Cell Batch Code No.	22F03
vi	Configuration of cells	15S1P
vii	Cell Type	Prismatic
viii	Cell certification report/Date	MTL/2K22/J/0374,0375, Dated:- 09.02.2023



CELL PHOTO

The label on the battery reads:
WELSON POWER
 Sealed Secondary Portable Lithium System Cells
 WSP-LFP48173166-165Ah
 3.2V/165Ah
 MFG Date: 120302
 MFG Date: 2022/12
 IS 16048 (Part 2): 2018 / IEC 62133-2: 2017
Caution:
 -Do not expose cell to melting, avoid heat or high temperature.
 -Do not reverse, short or connect the cell.
 -Do not tamp or slash and/or
 -If the cell terminals are dirty, clean with dry cloth.
 -Do not immerse in water.
 -Do not use improper charger.
 -Take the discarded cell to disposal to recycle them.
 IS-16048
 A-4 1165851

5	BMS	Description
i	BMS Make	Shenzhen Jiabaida Electronic Technology Co. Ltd
ii	BMS Model/ ID No.	AP21S002
iii	BMS Software version/ Hardware version	V1.3/ V1.22
iv	BMS Communication Protocol	RS 485, CAN (UART & 485& C
v	BMS EMC Test Report (referred)	CTOMS0591, 04.08.2023

BMS PHOTO

The PCB label reads:
JIABAIDA
 AP21S002 21S 200A
 Lifepo4 3.2v
 UART&485&C
 AN
 Common part with balance
 PN: 17010012 SN35022021

Below the photos, the text reads: **JBD-AP21S002 支持7~21S**





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Rishikesh Sharma Engineer	Manish Mandloi Sr. Engineer		Umesh Raghuwanshi Asst. Manager

6	Battery Charger	Description
i	Charger Sr. no.	2D70A010420580
ii	Charger (External/On Board)	External
iii	Charger Make / Model	ES4840
iv	Trade Name of Charger	Ecostar Innovation Pvt.Ltd.
v	Charger Type	SMPS External Charger






7	Sample Receipt date	30-06-2023
8	Condition of Sample	Good (No physical damage observed, nos. of samples: 06)
9	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.
10	Functional Verification	Functional verification done and REESS was found satisfactory
11	Test Method	Test method referred from AIS-156(Part II) 2022 amendment 3 Phase 2.
12	Test Description and date of Performance	Please refer the ANNEXURE-1 of this report
13	Conclusion	The REESS specified in Sr. No. 3.0 of this test report met all the test requirements when tested as per AIS-156(Part II) 2022 amendment 3 Phase 2 as mentioned in Annexure-1 of this report.
14	Test Results	Please refer the test requirements and results in ANNEXURE-I of this report
15	Test Location	EV Test Lab, NATRAX
16	Any Deviation or Exclusion from Test Method:	NO
17	Total No. of Pages	27 (Report with Annexures) + 2 (Drawings)

Remarks: Refer page 27 of 27 for Disclaimer		NATRAX CASE ID: NATRAX/TB/23-24/19	
Authorized Signatory:		Page 03 of 27	Format no. NATRAX/TB/L/2023/01
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Rishikesh Sharma Engineer	Manish Mandloi Sr. Engineer		Umesh Raghuwanshi Asst. Manager

ANNEXURE-1

1.0 TEST REQUIREMENTS AND RESULTS:

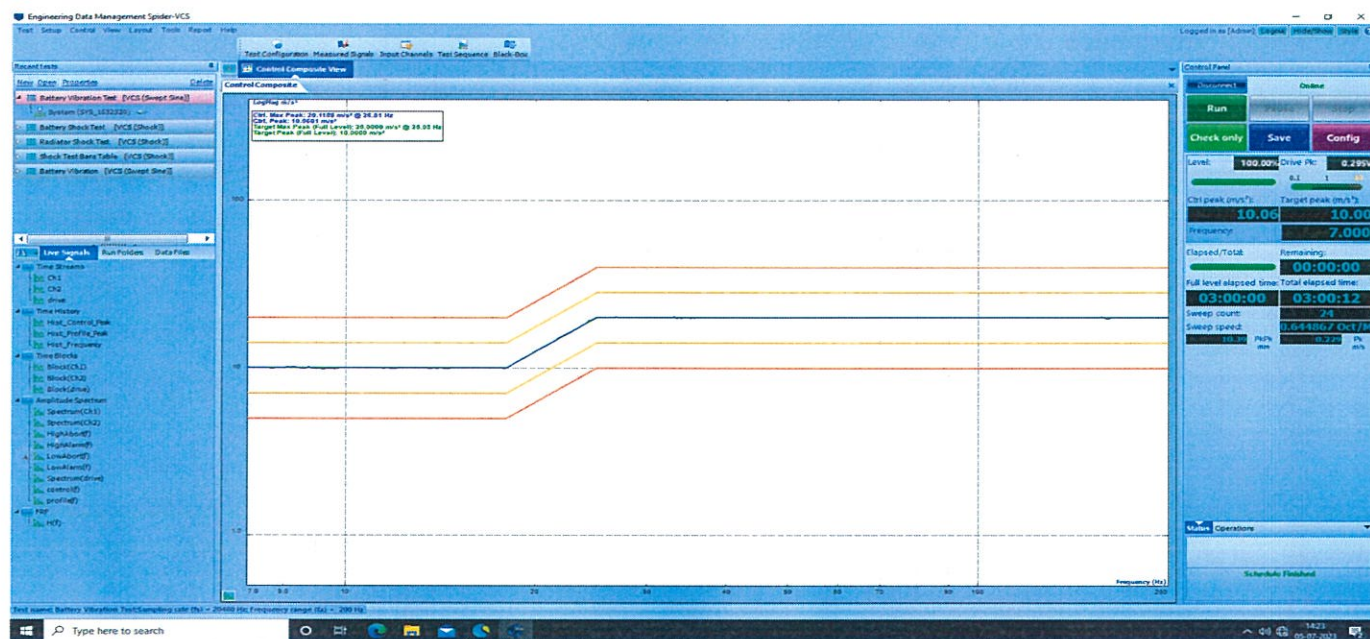
1.1	Vibration Test		
	Reference Standard: AIS 156(Part II)-2022 (A3P2)		
1.1.1	Procedure		
Sample ID: NATRAX/TB/23-24/19-04	Particulars	Parameter During Test	
	Test Component	REESS Subsystem (Battery Pack)	
	Ambient temperature (20 ± 10°C)	27 °C	
	Test Component SOC (>50%)	90 %	
	Protection Devices of DUT	Fuse	
	Test Axis	Z-Axis (Vertical Axis)	
	Test Component Weight	62 Kg	
	Frequency Type	Sinusoidal	
	Frequency Sweep	7 Hz to 200 Hz to 7 Hz Frequency [Hz] 7-18	
	For Weight 12Kg or More	Frequency [Hz]	Acceleration [m/s²]
		7-18	10
		18 - approximately 25	Gradually increased from 10 to 20
		25 - 200	20
	Frequency Sweep Time	15 Minutes	
	Total Frequency Sweep	12	
	Test Duration	3 Hours	
Observation duration after Standard Cycle	1 Hour		
Test Start Date	06.07.2023		
Test End Date	06.07.2023		
1.1.2	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.	
	Standard cycle	Standard cycle was feasible after test.	
	The isolation resistance measured after the test	Isolation resistance was found greater than 100Ω/Volt.	

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ANNEXURE-1

1.1.3

Vibration Test Setup (Photo)



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<p>Prepared By</p>	<p>Page 05 of 27</p> 	<p>Checked By</p>
		
<p>Rishikesh Sharma Engineer</p>		<p>Manish Mandloi Sr. Engineer</p>

ANNEXURE-1

1.2		Mechanical Drop Test	
1.2.1		Reference Standard: AIS 156(Part II)-2022 (A3P2)	
1.2.1		Procedure	
Sample ID: NATRAX/TB/23-24/26-07	Particulars	Parameter During Test	
	Test Component	REESS Subsystem (Battery Pack)	
	Ambient temperature (20 ± 10°C)	26 °C	
	Test Component SOC (≥90%)	90 %	
	Protection Devices of DUT	Fuse	
	Test Component Weight	62 Kg	
	Height of the free fall for REESS	1 m	
	Total no. of Drop (Free fall)	6 (Battery has 6 Faces)	
	DUT Free fall orientation	Each surface facing floor	
	Type of surface	Horizontal concrete pad	
	Test Duration	3 Hours	
	Observation duration after Standard Cycle	1 Hour	
	Test Start Date	24.08.2023	
	Test End Date	24.08.2023	

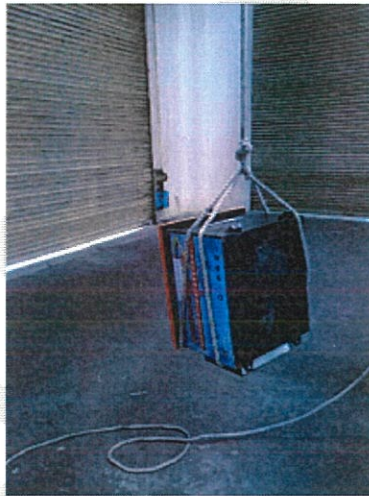
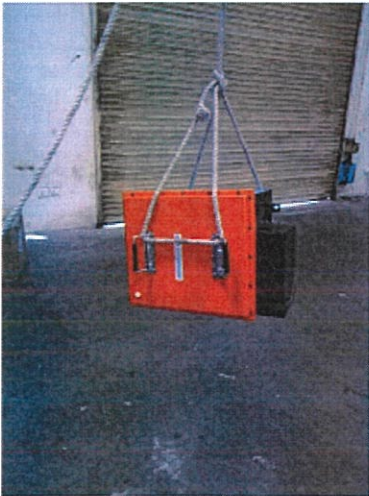
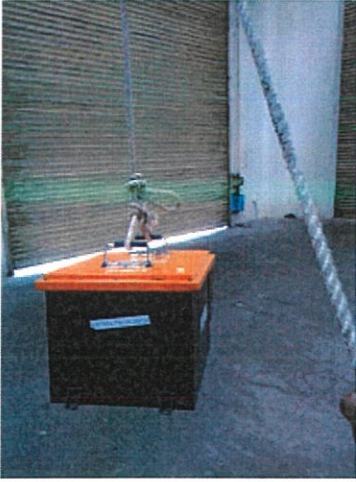
1.2.2		Test Result	
		Requirement	Observations
		During the test, there shall be no evidence of: (a) Electrolyte leakage (b) Rupture c) Fire (d) Explosion	No Electrolyte leakage, no rupture, no fire and no explosion.
		Standard cycle	Standard cycle was feasible after test.
		The isolation resistance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

Checked By




Rishikesh Sharma
Engineer

Manish Mandloi
Sr. Engineer




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ANNEXURE-1

1.3	Mechanical Shock Reference Standard: AIS 156(Part II)-2022 (A3P2)	
1.3.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-02	Particulars	Parameter During Test
	Test Component	REESS Subsystem (Battery Pack)
	Ambient temperature (20 ± 10°C)	26 °C
	Test Component SOC (>50%)	90 %
	Protection Devices of DUT	Fuse
	Test Axis	X-Axis (Linear Axis), Y-Axis (Lateral Axis) and Z-Axis (Vertical Axis)
	Test Component Weight	62 Kg
	Frequency Type	Half-Sine
	Peak Acceleration	500 m/s ²
	Pulse Duration	11 milliseconds
	Total Shock	18 (3 shocks in the positive direction followed by 3 shocks in the negative direction in all 3 axis)
	Observation duration after Standard Cycle	1 Hour
	Test Start Date	07.07.2023
	Test End Date	07.07.2023

1.3.2	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.
	Standard cycle	Standard cycle was feasible after test.
	The isolation resistance measured after the test.	Isolation resistance was found greater than 100Ω/Volt.

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Rishikesh Sharma Engineer			Manish Mandloi Sr. Engineer

ANNEXURE-1

1.3.3

Mechanical Shock Test Setup (Photo)

Test Report

Report time: Jul-07-2023 17:55:05
 Test name: Radiator Shock Test
 Test status: Test Stopped (Schedule Finished)

Data measured at: Jul-10-2023 11:10:53
 Test type: VCS (Shock)
 Run folder: VIBRATION-1783 Jul 07, 2023 17-52-10

Testing time

Remaining pulse: 1.0
 Run Start Time: Jul-07-2023 17:52:11

Total elapsed: 11.0

Full level elapsed: 0.0

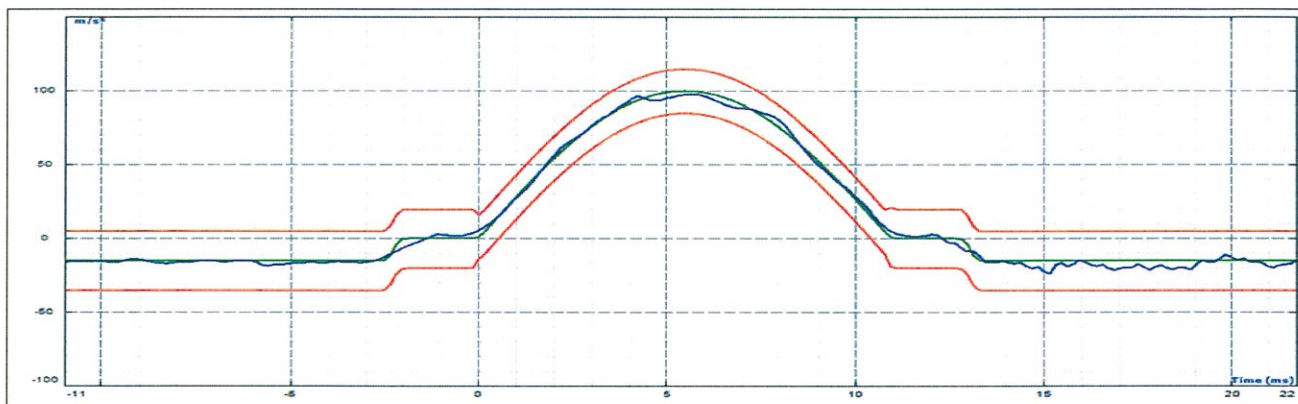
Test parameters

Sampling Rate (fs): 6400.00 Hz
 Block Time: 0.32 s

Frequency range (fa): 2500.00 Hz

Block Size: 2048

Control Composite



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Prepared By

Checked By

Rishikesh Sharma
 Engineer

Manish Mandloi
 Sr. Engineer

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ANNEXURE-1

2.1	Thermal Shock & Cycling Test Reference Standard: AIS 156(Part II)-2022 (A3P2)	
2.1.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-01	Particulars	Parameter During Test
	Test Component	REESS Subsystem (Battery Pack)
	Ambient temperature (20 ± 10°C)	27 °C
	Test Component SOC (>50%)	80 %
	Protection Devices of DUT	Fuse
	Positive Set Temperature	60 °C
	Positive Temperature Duration	6 Hours
	Time taken to reach Negative Set Temperature	20 Minutes
	Negative Set Temperature	-40°C
	Negative Temperature Duration	6 Hours
	Time taken to reach Positive Set Temperature	20 Minutes
	No of Cycles	5
	Storage Time	24 Hours after test
	Test Start Date	06.07.2023
Test End Date	12.07.2023	

2.1.2	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.
	Standard cycle	Standard cycle was feasible after test.
	The isolation resistance measured after the test.	Isolation resistance was found greater than 100Ω/Volt.

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ANNEXURE-1

2.1.3

Thermal Shock & Cycling Test Setup (Photo)



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Prepared By

Checked By




Rishikesh Sharma
Engineer

Manish Mandloi
Sr. Engineer

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ANNEXURE-1


3.1	Fire Resistance Test Reference Standard: AIS 156(Part II)-2022 (A3P2)	
3.1.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-01	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
	Grating Table steel rods diameter (Eqvl.)	6-10 mm
	Distance between Grating Table steel rods	4-6 Cm
	Fuel	Petrol
	Fuel Pan Dimension	L- 450mm, B- 350mm, H- 80mm
	Fuel Level from Pan Top	< 8 cm
	Distance between Fuel Level and DUT	50 cm
	Fixed Component	Fuel Pan
	Movable Component	DUT Fixture
	Screen Height from Fuel Level	3 cm
	Length and Width of the screen	2 to 4 cm smaller than Pan
	Screen Material (Brick)	SK 30
	Test Lab Ventilation	Yes (Indoor with Ventilation)
	Test Parameter	
	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	12.07.2023	
Test End Date	12.07.2023	

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Rishikesh Sharma Engineer	



Checked By

Manish Mandloi Sr. Engineer

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

3.1.3	Test Setup
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Rishikesh Sharma			Manish Mandloi	
Engineer			Sr. Engineer	

ANNEXURE-1 PROTECTION VARIFICATION

4.1	External Short Circuit Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)	
4.1.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-05	Particulars	Parameters During Test
	Test Component	REESS Subsystem (Battery Pack)
	Battery Management System	Available
	Ambient temperature (20 ± 10°C)	27 °C
	Test Component SOC (>50%)	80 %
	Protection Devices of DUT	Fuse
	DUT Condition	Active Mode
	Test Component Weight	62 Kg
	Connector resistance	< 5 mΩ
	Test Stopped when	REESS's operated and interrupted the short circuit.
	Observation duration after Standard Cycle	1 Hour
	Test Start Date	08.07.2023
	Test End Date	08.07.2023

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Engineer

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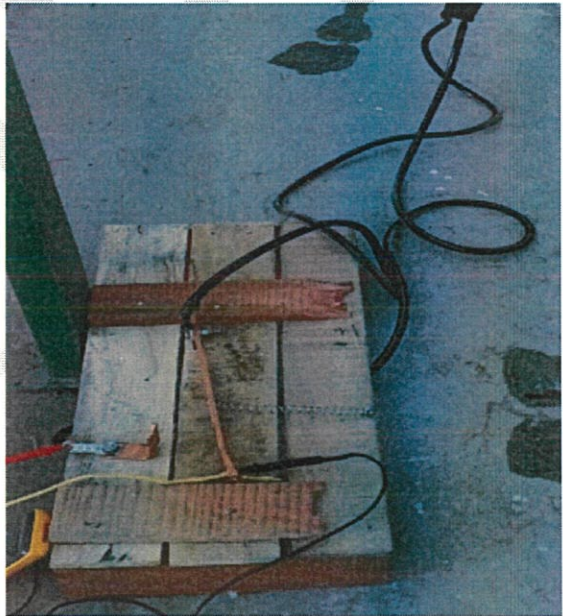


Checked By



Manish Mandloi
Sr. Engineer

4.1.2 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.
External Short Circuit Protection	REESS's operated and interrupted the 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 for 1 hour	Normal Functionality was observed.
The isolation resistance measured after the test.	Isolation resistance was found greater than 100Ω/Volt.

4.1.3 Test Setup	
	

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Rishikesh Sharma Engineer		Manish Mandloi Sr. Engineer

ANNEXURE-1

4.2	Over-Charge Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)	
4.2.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-02	Particulars	Parameter During Test
	Test Component	REESS Subsystem (Battery Pack)
	Battery Management System	Available
	Ambient temperature (20 ± 10°C)	26 °C
	Protection Devices of DUT	Fuse
	DUT Condition	Active Mode
	Charging Current	40 A
	Test Stopped when	The charging continued until the tested-device (automatically) interrupts or limits the charging.
	Observation Period	1 Hour
	Test Start Date	05.07.2023
Test End Date	05.07.2023	

4.2.2	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-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 100Ω/Volt.

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Rishikesh Sharma Engineer			Manish Mandloi Sr. Engineer



4.2.3 Test Setup

1	Test Name:	Over Charge PPAP 48v165, S4						
2	Test Date:	05-07-23 10:34						
3	Operator ID:	Admin						
4	Program Name:	CHARGE						
5	Program Description:							
6	Program Data:	C:\VisualCN\Programs\NATRAX.mdb						
7	Module Type:							
8	Module Description:							
9	Address:	Port: 1, Sys Controller: 3 Circuit: 7						
10	Name:	Port 1, Ctrl 3, Addr 7						
11								
12	Exclude	Total Time,	Current, A	Voltage, V	Power, W	Constant	Internal F	Amp-Hr
13	No	0:00:01.0	40	49.56	1486	0	0	0
14	No	0:00:02.0	40	49.59	1487	0	0	0.01
15	No	0:00:03.0	40	49.62	1488	0	0	0.02
16	No	0:00:04.0	40	49.64	1489	0	0	0.03
17	No	0:00:05.0	40	49.66	1489	0	0	0.04
18	No	0:00:06.0	40	49.68	1490	0	0	0.04
10998	No	3:03:05.0	40	51.36	1540	0	0	91.36
10999	No	3:03:06.0	40	51.37	1541	0	0	91.37
11000	No	3:03:07.0	40	51.39	1541	0	0	91.38
11001	No	3:03:08.0	40	51.4	1542	0	0	91.39
11002	No	3:03:09.0	40	51.42	1542	0	0	91.4
11003	No	3:03:10.0	-0.01	67.6	0	0	0	91.4
11004	No	3:03:11.0	0	73.72	0	0	0	91.4
11005	No	3:03:12.0	-0.01	79.6	0	0	0	91.4
11006	No	3:03:13.0	0	73.6	0	0	0	91.4

Over_Charge_PPAP_48v165, S1

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Prepared By

Checked By

Rishikesh Sharma
Engineer

Manish Mandloi
Sr. Engineer




ANNEXURE-1

4.3		Over-Discharge Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)	
4.3.1		Procedure	
Sample ID: NATRAX/TB/23-24/19-02	Particulars	Parameter During Test	
	Test Component	REESS Subsystem (Battery Pack)	
	Battery Management System	Available	
	Ambient temperature (20 ± 10°C)	27 °C	
	Protection Devices of DUT	Fuse	
	DUT Condition	Active Mode	
	Discharging Current	70 A	
	Test Stopped when	The discharging continued until the tested-device (automatically) interrupts or limits the discharging.	
	Observation Period	1 Hour	
	Test Start Date	06.07.2023	
Test End Date	06.07.2023		

4.3.2		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-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 100Ω/Volt.		

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4.3.3 Test Setup

	A	B	G	H	I	J	K	L	M
1	Test Name: Over Discharge PPAP, S2								
2	Test Date: 06-07-23 12:37								
3	Operator ID Admin								
4	Program Na Dis-charge								
5	Program Description:								
6	Program Da C:\VisuaLCN\Programs\NATRAX.mdb								
7	Module Typ yd								
8	Module De: LCV 100-80								
9	Address: Port: 1, Sys Controller: 3 Circuit: 6								
10	Name: Port 1, Ctrl 3, Addr 6								
11									
12	Exclude	Total Time	Step	Step Time,	Current, A	Voltage, V	Power, W	Constant	Interna
13	No	0:00:01.0	1	0:00:01.0	-70	49.31	-2465	0.99	0
14	No	0:00:02.0	1	0:00:02.0	-70	49.28	-2463	0.99	0
15	No	0:00:03.0	1	0:00:03.0	-70	49.25	-2462	0.98	0
16	No	0:00:04.0	1	0:00:04.0	-70	49.23	-2461	0.98	0
17	No	0:00:05.0	1	0:00:05.0	-70	49.21	-2460	0.98	0
18	No	0:00:06.0	1	0:00:06.0	-70	49.19	-2459	0.98	0
19	No	0:00:07.0	1	0:00:07.0	-70	49.17	-2458	0.98	0
5046	No	1:23:54.0	1	1:23:54.0	-70	39.27	-1963	0.79	0
5047	No	1:23:55.0	1	1:23:55.0	-70	39.22	-1961	0.78	0
5048	No	1:23:56.0	1	1:23:56.0	-70	39.18	-1958	0.78	0
5049	No	1:23:57.0	1	1:23:57.0	-70	39.13	-1956	0.78	0
5050	No	1:23:58.0	1	1:23:58.0	-70	39.07	-1953	0.78	0
5051	No	1:23:59.0	1	1:23:59.0	-0.01	-24.7	0	25	0
5052	No	1:24:00.0	1	1:24:00.0	-0.01	-21.88	0	25	0
5053	No	1:24:01.0	1	1:24:01.0	-0.01	-19.19	0	25	0

Over_Discharge_PPAP_S2

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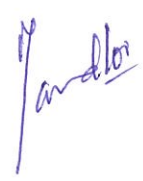
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ANNEXURE-1




4.4	Over-Temperature Protection Reference Standard: AIS 156(Part II)-2022 (A3P2)	
4.4.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-04	Particulars	Parameter During Test
	Test Component	REESS Subsystem (Battery Pack)
	Temperature Sensor	On Board
	Battery Management System	Available
	Protection Devices of DUT	Fuse
	Chamber Temperature	60°C
	DUT Condition	Active Mode
	Charging Current	40 A
	Discharging Current	70 A
	Test Stopped when	Battery inhibits and/or limits the charge and/or discharge to prevent the temperature increase- (Auto Cut-off)
	Observation Period	1 Hour
	Test Start Date	12.07.2023
Test End Date	12.07.2023	

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 100Ω/Volt.

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ANNEXURE-1

4.5	Thermal Propagation Reference Standard: AIS 156(Part II)-2022 (A3P2)	
4.5.1	Procedure	
Sample ID: NATRAX/TB/23-24/19-03	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
	Initiation cell temperature	22°C
	Maximum temperature (define by the manufacturer)	60°C
	DUT Condition	OK
	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) $dT/dt \geq [1^\circ\text{C/s}]$ 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	12.07.2023
Test End Date	12.07.2023	

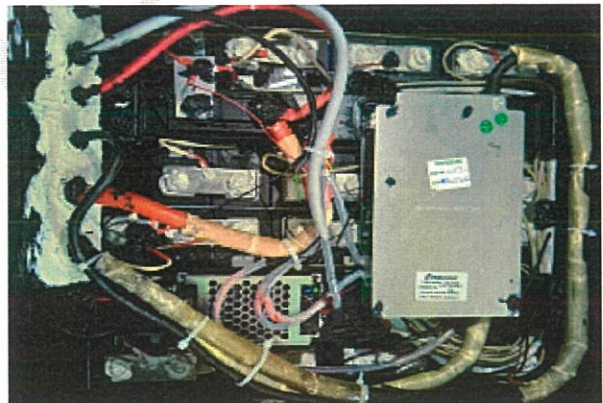
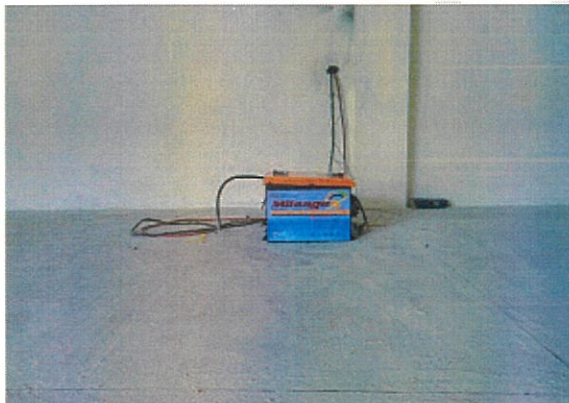
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Rishikesh Sharma Engineer			Manish Mandloi Sr. Engineer

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

4.6.3 Test Setup

	A	B	I	J	K	X	Y	Z
1	Test Name:	Tharmal Propagation PPAP 51v165Ah. S6						
2	Test Date:	12-07-23 10:30						
3	Operator ID:	Admin						
4	Program Name:	3.7V 16Ah						
5	Program Description:							
6	Program Datab. C:\VisualCN\Programs\NATRAX.mdb							
7	Module Type:							
8	Module Description:							
9	Address:	Port: 1, Sys Controller: 3 Circuit: 4						
10	Name:	Port 1, Ctrl 3, Addr 4						
11								
12	Exclude	Total Time, (h	Current, A	Voltage, V	Power, W	Temper	Temper	Unassig
13	No	0:00:01.0	70	3.67	256	22.8	22.1	0
14	No	0:00:02.0	69.99	3.67	256	22.8	22.1	0
15	No	0:00:03.0	70	3.68	257	22.8	22.1	0
16	No	0:00:04.0	70	3.68	257	22.8	22.1	0
17	No	0:00:05.0	70	3.69	258	22.8	22.1	0
5764	No	1:53:46.0	70	7.79	545	67.3	74.9	0
5765	No	1:53:47.0	70	7.95	556	67.3	75	0
5766	No	1:53:48.0	70	8.11	567	67.4	75.1	0
5767	No	1:53:49.0	70	8.28	579	67.4	75.1	0
5768	No	1:53:49.6	70	8.38	586	67.5	75.1	0
5769								
5770	Notes:	5.50, MDB 11.88						

Tharmal Propagation PPAP 51v165



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ANNEXURE-1 Water Ingress Protection Test

4.6 TEST REQUIRMENTS AND RESULTS:

	IPX7 Reference Standard: IEC 60529 AIS-156 A3 P2
	Procedure
Sample ID: NATRAX/TB/23-24/19-06	REESS with 100% SOC shall be tested:- <input checked="" type="checkbox"/> The lowest point of enclosures with a height less than 850 mm is located 1000 mm below the surface of water. <input type="checkbox"/> 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: - 10-07-2023 Test duration: - 30 min Acceptance Criteria: - There shall be no fire or explosion during testing of REESS. Test Result: - At the end of the test, no fire and no explosion was observed from tested device.

4.6.1 Test Setup



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Rishikesh Sharma Engineer			Manish Mandloi Sr. Engineer



ANNEXURE-1

Sr.N	Cl. No.	Verification/Test Name	Date	Observation	Result
5.0 Verifications:					
5.1	6.1.2.1	BMS Shall be microprocessor/ microcontroller-based circuit	12.07.2023	Microcontroller Make: NUVOTON	Complied
5.2	6.1.2.3 (a)	BMS over charge protection	05.07.2023	51.42V	Complied
5.3	6.1.2.3 (b)	BMS over discharge protection	06.07.2023	39.07V	Complied
5.4	6.1.2.3 (c)	BMS over temperature	08.07.2023	T charge = 50°C T discharge = 50°C	Complied
5.5	6.1.2.3 (d)	BMS over current protection	08.07.2023	Verified	Complied
5.6	6.1.2.3 (e)	BMS Short circuit protection	08.07.2023	Verified	Complied
5.7	6.1.3(a)	Charger voltage cut off	12.07.2023	54.0 V	Complied
5.8	6.1.3(b)	Soft start function	12.07.2023	Initial Current = 2.1 A Set Current = 40.6 A	Complied
5.9	6.1.3 (c)	Pre-charge function to detect over discharge	10.07.2023	Verified	Complied
5.10	6.1.3(d)	Input supply variation with battery pack	12.07.2023	Verified	Complied
5.11	6.1.3(f)	Communication verification with battery pack	10.07.2023	Verified	Complied
5.12	Annexure 8k-(3)	Verification of cell charge/discharge cycle data	06.07.2023	Verified	Complied
5.13	Annexure 8k-(7)	Verification of the cell to cell spacing in battery pack	08.07.2023	1 mm	Complied
5.14	Annexure 8k-(8)	Verification of additional safety fuse/ circuit breaker	08.07.2023	Verified	Complied
5.15	Annexure 8k-(9)	Verification of the cells, BMS charger w.r.t serial number	12.07.2023	Verified	Complied

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Rishikesh Sharma Engineer			Manish Mandloi Sr. Engineer

ANNEXURE-1

Sr.N	Cl. No.	Verification/Test Name	Date	Observation	Result
5.0 Verifications:					
5.16	Annexure 8k-(10)	Protection against regenerative	12.07.2023	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)	06.08.2023	Report no: CTOMS0591, 04.08.2023	Complied
5.18	6.1.3(e)	Earth leakage detection	12.07.2023	Verified	Complied
5.19	Annexure 8k-(1)	Verification of manufacturing date on cell	08.07.2023	Verified	Complied
5.20	Annexure 8k-(2)	Cell report Verification as per IS 16893	08.07.2023	Report no: MTL/2K22/J/0374, 0375, Dated:- 09.02.2023	Complied
5.21	Annexure 8k-(4)	Verification of pressure release vent	08.07.2023	Verified	Complied
5.22	Annexure 8k-(5)	Verification of temperature sensor	08.07.2023	Verified	Complied
5.23	Annexure 8k-(6)	Verification of action paralleling circuit in the battery pack	08.07.2023	Verified	Complied
5.24	Annexure 8k-(11)	BMS data logging	12.07.2023	Verified	Complied

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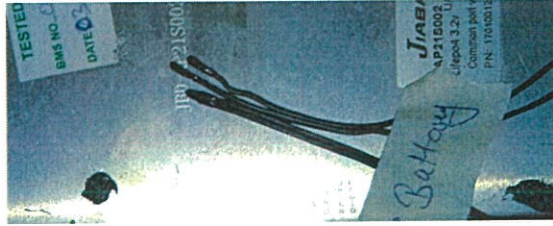

 Rishikesh Sharma
 Engineer

 Manish Mandloi
 Sr. Engineer

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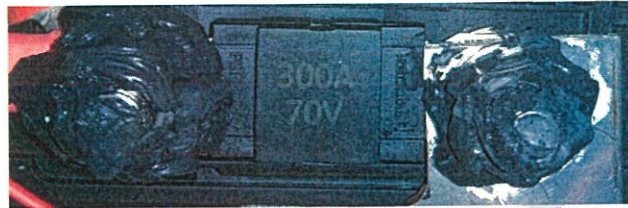
Verification of Temperature Sensor



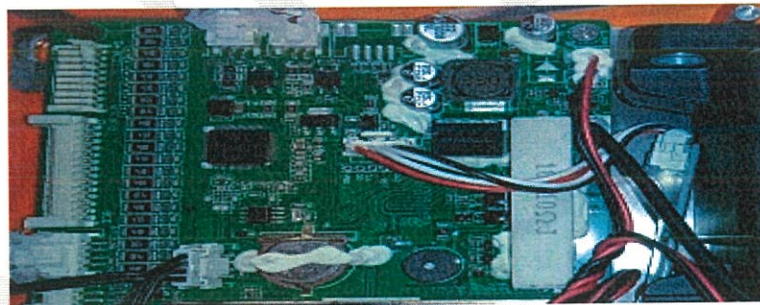
Verification of Pressure Release vent & Visual Alarm



Verification of Safety Fuse- 300A



Verification of Microcontroller-based circuit



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Engineer

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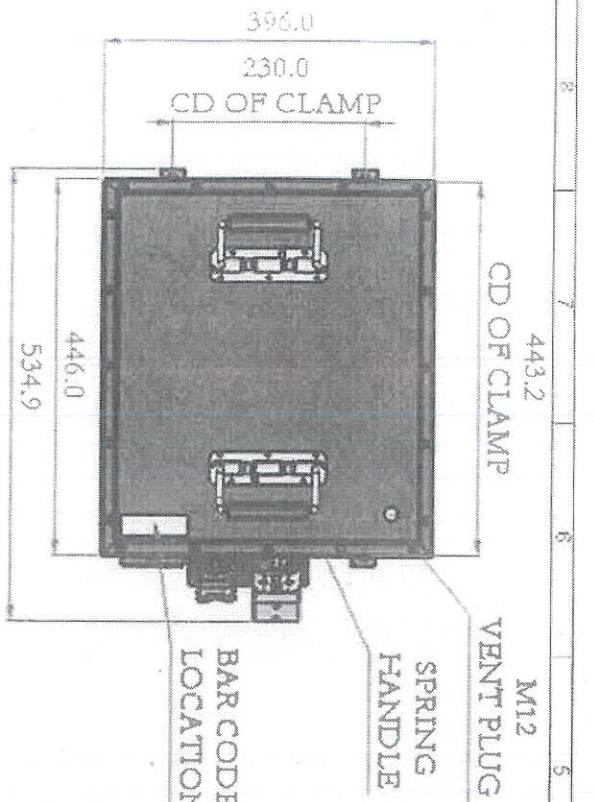


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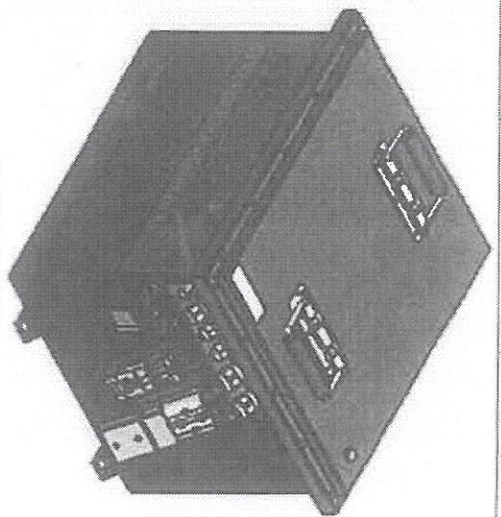
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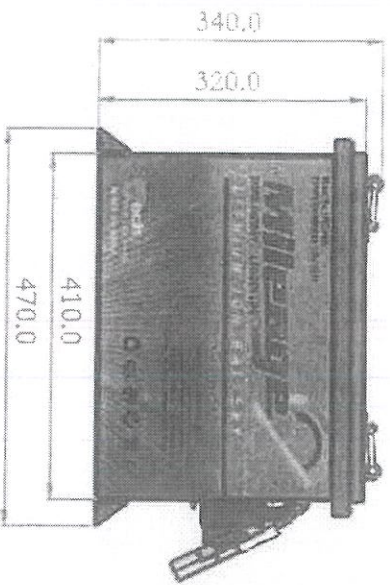
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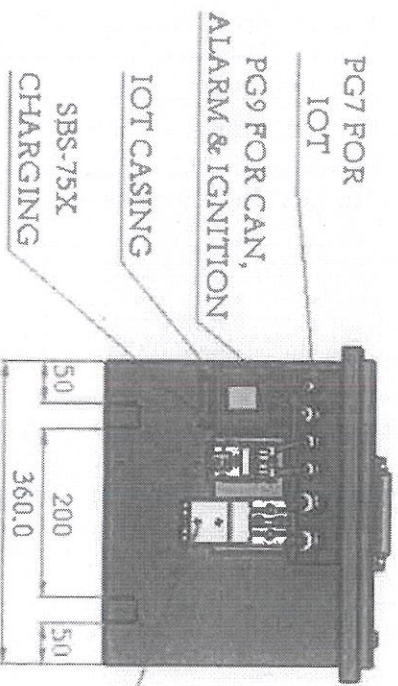
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

PG7 FOR IOT
PG9 FOR CAN, ALARM & IGNITION
IOT CASING
SBS-75X CHARGING

ANDERSON-175 DISCHARGING



General Tolerance Chart (in mm)

Length or Dia	0.6 - 5.30	5.30 - 120	120 - 315	315 - 1000	1000 - 2300	2300 - 4000
Dimension	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2

NAME	DATE	SIGNATURE
Prepared By: K. SINGH	12/01/23	
Checked By: S. SINGH	13/01/23	
Approved By: S. SINGH	13/01/23	

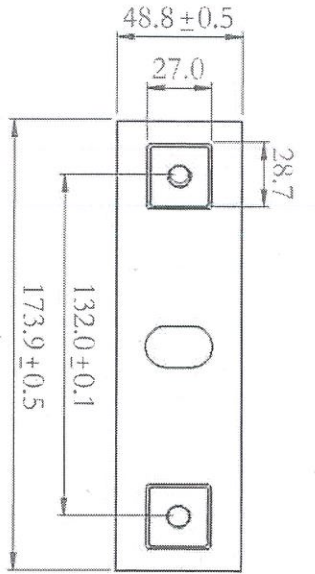
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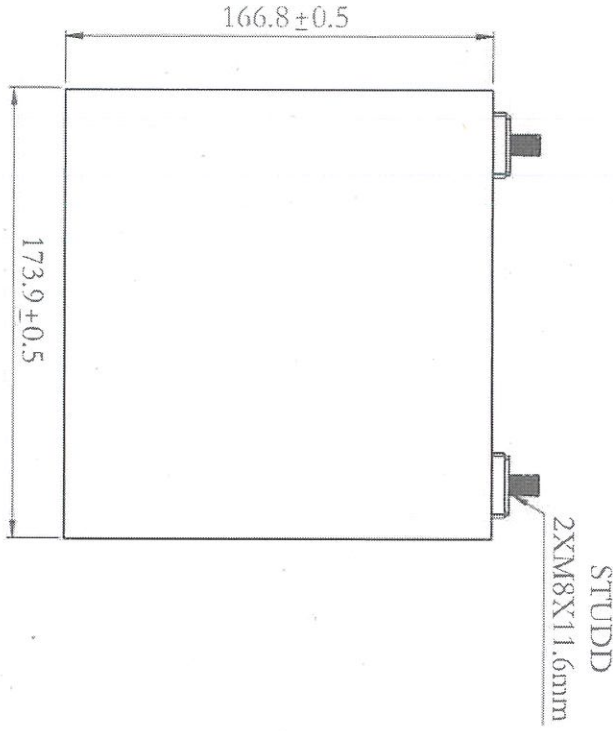
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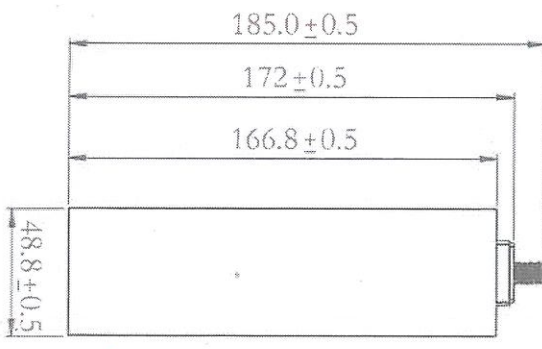
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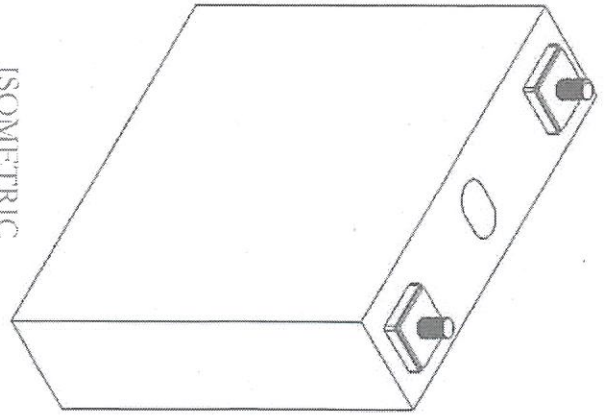
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Checked By S. SINGH	25/05/23	<i>[Signature]</i>
Approved By S. SINGH	25/05/23	<i>[Signature]</i>

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