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Test Summary per UN 38.3.5

Mfg Company Name	Inventus Power Inc
Mfg Company Address	1200 Internationale Parkway
Mfg Company City, State, Country, Postal Code	Woodridge, IL, USA, 60517
Mfg Contact Name	Ismat Jahan
Mfg Contact Email	ismat.jahan@inventuspower.com
Mfg Contact Phone Number	630-730-0397

Product Name(s)	Teal Drones , Inc
Product Part Number(s)	GETAC-BP
Nominal Voltage (V)	21.6
Rated Capacity (mAh)	3120
Mass (g)	387
Rated Energy (Wh)	67.392

Product Photo



Product Type	Battery Pack, Secondary (Lithium Ion), Small
Test Standard	UN38.3, UN Manual of Tests and Criteria, 7th Revised Edition, Effective January 1, 2020
Overall Test Result	PASS

Component Test Results

Altitude (T.1)	PASS
Thermal (T.2)	PASS
Vibration (T.3)	PASS
Shock (T.4)	PASS
External Short Circuit (T.5)	PASS
Overcharge (T.7)	PASS

**Note: Tests T.6 (Impact/Crush) and T.8 (Forced Discharge) are applicable to cell-level testing only.*

Release Approved By

Name John C. Copeland, Vice President and COO
Date 2/8/2021

Test Standard: UN38.3, UN Manual of Tests and Criteria, 7th Revised Edition,
Effective January 1, 2020



UN 38.3 Report - Small, Secondary, Battery Packs

PROJECT NUMBER EA4123
DATE OF REPORT 2/8/2021
STATUS Compliant
DATE SAMPLES RECEIVED 8/12/2020, 12/22/2020

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Contact Phone Number 630-730-0397
Company Name Inventus Power Inc
Company Address 1200 Internationale Parkway
Company City, State, Country, Postal Code Woodridge, IL, USA, 60517
Product Name(s) Teal Drones, Inc
Product Part Number(s) GETAC-BP

Nominal Voltage (V)	21.600		Projected 25X Duration
Rated Capacity (mAh)	3120		2 days
Charge Current for 25X cycling - CC mode (mA)	5000	[1.6C]	
Maximum Continuous Charge Current (mA)	6000		Rated Energy
Normal Charge Voltage (V)	25.200		67.4 Wh
Maximum Charge Voltage (V)	25.500		
End of Charge Current - CV mode (mA)	500	[0.16C]	
Discharge Current for 25X Cycling (mA)	7500	[2.4C]	
Maximum Specified Discharge Current (mA)	9000		
End of Discharge Voltage (V)	14.000		

Nominal Mass of Battery (grams) 387
Mass Loss Critical Threshold (Lookup) 0.001
Small or Large Battery (Lookup) Small
Mass Precision (Calculated Digits) 2

Sample Numbering Legend F Fresh (cycle 1); fully charged
C Cycled (cycle 25); fully charged
S (Spare)

V-Check Criteria

Post Test Voltage ≥ 90% Pre-Test Voltage

M-Check Criteria

Mass (M) of cell or	Mass loss limit
M<1g	0.5%
1g≤M≤75g	0.2%
M>75g	0.1%

Report Summary Comments

Samples tested demonstrated compliance to the referenced standard.

General notes regarding this report: Test results relate only to the items tested. Energy Assurance reserves the right to use approved partner laboratories in the delivery of services. This is denoted below by a "Y" in the OS field of each test section below. This report shall not be reproduced except in full without the approval of Energy Assurance, LLC.

Revision History

Rev	Date	Comments
1		Initial issue

Reviewed & Released By:

John C. Copeland

Name John C. Copeland, Vice President and COO
Date 2/8/2021

Product Photo:



Altitude Simulation (T.1)

Test Procedure: Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 ° C).

Date (Test Start)	1/25/2021	OS	N
Date (Test Finish)	1/25/2021	Tech	JG
Test Ambient (°C)	20.0		
Model Tested	GETAC-BP	Rated Capacity (mAh)	3120

Pressure at beginning of test (PSIA)		Pressure EOT (PSIA)	
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**Note regarding pressure (vacuum). 11.6 kPa absolute is equal to 1.68 PSIA. EA vacuum indicators read in PSIA, thus that will be recorded before and after testing. Note also that both the before and after readings must be less than or equal to 1.68 to be compliant. If an alternative calibrated indicator must be used that reads in different units, see engineering for guidance.*

Test Step Notes (T.1) None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure					Comments
							Leakage	Venting	Dis-Assy	Rupture	Fire	
C1	24.71	385.82	24.68	385.80	Pass	Pass	N	N	N	N	N	None
C2	24.63	386.71	24.58	386.70	Pass	Pass	N	N	N	N	N	None
C3	24.58	385.51	24.61	385.49	Pass	Pass	N	N	N	N	N	None
C4	24.59	387.60	24.58	387.59	Pass	Pass	N	N	N	N	N	None
F1	24.46	386.25	24.43	386.22	Pass	Pass	N	N	N	N	N	None
F2	24.60	387.23	24.58	387.21	Pass	Pass	N	N	N	N	N	None
F3	24.62	385.65	24.61	385.62	Pass	Pass	N	N	N	N	N	None
F4	24.59	386.21	24.58	386.18	Pass	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	A&D GX-4000 (301-4100g), S/N 14554603
Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 15
Timer	Accurite Timer, S/N 2312
Vacuum Gauge	Wika 0-30IN-HG, S/N PG-02

Thermal Test (T.2) --- Note: Battery size is Small

Test Procedure: *Test cells and batteries are to be stored for at least six hours at a test temperature equal to $72 \pm 2^\circ\text{C}$, followed by storage for at least six hours at a test temperature equal to $-40 \pm 2^\circ\text{C}$. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ($20 \pm 5^\circ\text{C}$). For large cells and batteries, the duration of exposure to the test temperature should be at least 12 hours.*

Date (Test Start)	1/27/2021	OS	N
Date (Test Finish)	2/2/2021	Tech	JG
Model Tested	GETAC-BP	Rated Capacity (mAh)	3120

Test Step Notes (T.2) None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure					Comments
							Leakage	Venting	Dis-Assy	Rupture	Fire	
C1	24.57	385.86	24.48	385.67	Pass	Pass	N	N	N	N	N	None
C2	24.53	386.76	24.44	386.59	Pass	Pass	N	N	N	N	N	None
C3	24.50	385.56	24.40	385.39	Pass	Pass	N	N	N	N	N	None
C4	24.51	387.65	24.42	387.48	Pass	Pass	N	N	N	N	N	None
F1	24.25	386.26	24.51	386.10	Pass	Pass	N	N	N	N	N	None
F2	24.50	387.26	24.32	387.11	Pass	Pass	N	N	N	N	N	None
F3	24.53	385.66	24.05	385.51	Pass	Pass	N	N	N	N	N	None
F4	24.51	386.24	24.42	386.08	Pass	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	A&D GX-4000 (301-4100g), S/N 14554603
Temperature Chamber	Test Equity 1007H, S/N 61593

Vibration (T.3) --- Note: Battery size is Small

Test Procedure: Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).

For cells and small batteries: from 7 Hz a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency is increased until a peak acceleration of 8 g_n occurs (approximately 50 Hz). A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200 Hz.

For large batteries: from 7 Hz a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency is increased until a peak acceleration of 2 g_n occurs (approximately 25 Hz). A peak acceleration of 2 g_n is then maintained until the frequency is increased to 200 Hz.

Date (Test Start)	2/2/2021	OS	N
Date (Test Finish)	2/4/2021	Tech	JG
Test Ambient(°C)	20.0		
Model Tested	GETAC-BP	Rated Capacity (mAh)	3120

Test Step Notes (T.3) None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure					Comments
							Leakage	Venting	Dis-Assy	Rupture	Fire	
C1	24.48	385.67	24.40	385.70	Pass	Pass	N	N	N	N	N	None
C2	24.44	386.59	24.29	386.64	Pass	Pass	N	N	N	N	N	None
C3	24.40	385.39	24.20	385.44	Pass	Pass	N	N	N	N	N	None
C4	24.42	387.48	24.23	387.53	Pass	Pass	N	N	N	N	N	None
F1	24.51	386.10	24.44	386.14	Pass	Pass	N	N	N	N	N	None
F2	24.32	387.11	24.04	387.15	Pass	Pass	N	N	N	N	N	None
F3	24.05	385.51	23.91	385.54	Pass	Pass	N	N	N	N	N	None
F4	24.42	386.08	24.25	386.12	Pass	Pass	N	N	N	N	N	None
S1				6.00	No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	A&D GX-4000 (301-4100g), S/N 14554603
Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 13
Vibration Controller	Vibration Research VR9500, S/N 950C75B4
ICP Accelerometer	PCB Piezotronics 352C03 (10mV/G), S/N LW136337

Shock (T.4) --- Note: Battery size is Small

Test Procedure:

Cells and batteries are firmly secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

Each cell shall be subjected to a half-sine shock of peak acceleration of 150 g_n and a pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 g_n and a pulse duration of 11 milliseconds.

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

Small batteries: 150 g_n or result of formula, whichever is smaller

$$Acceleration (g_n) = \sqrt{\left(\frac{100850}{mass \text{ in kg}}\right)}$$

Large batteries: 50 g_n or result of formula, whichever is smaller

$$Acceleration (g_n) = \sqrt{\left(\frac{30000}{mass \text{ in kg}}\right)}$$

Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

NOTE: IEC Standard 60086-2-27 (Fourth Edition 2008-02): Environmental testing-Part 2-27: Tests - Ea and guidance: Shock provides guidance on tolerance for acceleration and pulse duration.

Date (Test Start)	2/4/2021	OS	N	Calculated Required Peak Acceleration (g _n)	150
Date (Test Finish)	2/4/2021	Tech	JG	Calculated Required Pulse Width (ms)	6
Test Ambient (°C)	19.0	Rated Capacity (mAh)	3120		
Model Tested	GETAC-BP				

Test Step Notes (T.4) None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure					Comments
							Leakage	Venting	Dis-Assy	Rupture	Fire	
C1	24.40	385.70	24.38	386.11	Pass	Pass	N	N	N	N	N	None
C2	24.29	386.64	24.25	386.61	Pass	Pass	N	N	N	N	N	None
C3	24.20	385.44	24.17	385.42	Pass	Pass	N	N	N	N	N	None
C4	24.23	387.53	24.20	387.50	Pass	Pass	N	N	N	N	N	None
F1	24.44	386.14	24.43	386.12	Pass	Pass	N	N	N	N	N	None
F2	24.04	387.15	24.00	387.13	Pass	Pass	N	N	N	N	N	None
F3	23.91	385.54	24.28	385.54	Pass	Pass	N	N	N	N	N	None
F4	24.25	386.12	24.22	386.10	Pass	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	A&D GX-4000 (301-4100g), S/N 14554603
Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 13
Signal Conditioner	PCB Piezotronics 4-Channel 482A22, S/N 772
ICP Shock Sensor	PCB Piezotronics 350A14, S/N 40088
Oscilloscope	Atten ADS 1102CAL, S/N ADS00003110272

External Short Circuit (T.5)

Test Procedure:

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57 ± 4 °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

Date (Test Start)	2/5/2021	OS	N
Date (Test Finish)	2/5/2021	Tech	JG
Chamber Ambient Temp at Start of Test (°C)	56.0		
Model Tested	GETAC-BP	Rated Capacity (mAh)	3120

Test Step Notes (T.5) None

Observations (Y/N) - Presence is a failure.

**For Dis-Assy, Rupture, & Fire, observation period is test completion + 6 hours.*

	MaxTemp	Observations (Y/N)			Short-Circuit System		Comments	
	°C	T>170°C	Dis-Assy	Rupture	Fire	Ch#		mΩ
C1	55.6	Pass	N	N	N	BB-1	76	None
C2	55.4	Pass	N	N	N	BB-2	69	None
C3	55.9	Pass	N	N	N	BB-4	90	None
C4	54.8	Pass	N	N	N	BB-5	76	None
F1	55.4	Pass	N	N	N	BB-1	76	None
F2	55.4	Pass	N	N	N	BB-2	69	None
F3	56.8	Pass	N	N	N	BB-4	90	None
F4	55.3	Pass	N	N	N	BB-5	76	None
S1		No Data						Spare1
S2		No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

Impedance Meter	ESI Model 253, S/N L2030988253
Datalogger	HP34970A, S/N MY44028320
Short Circuit System	Short-Circuit Test Apparatus, HOTBOX2-BB

< For short-circuit resistance verification

Overcharge (T.7)

Test Procedure: *The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:*

(a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

(b) when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

Date (Test Start)	10/5/2020	OS	N
Date (Test Finish)	10/7/2020	Tech	JG/BO
Model Tested	GETAC-BP	Rated Capacity (mAh)	3120

Test Step Notes (T.7) None

**For Dis-Assy & Fire, observation period is test completion + 7 days.*

Setup Conditions		Dis-Assy	Fire	Overcharge Channel	Pass/Fail	Comments
Charge Current 12000 mA	C5	N	N	Box2-1	Pass	None
	C6	N	N	Box2-2	Pass	None
	C7	N	N	Box2-4	Pass	None
	C8	N	N	Box2-5	Pass	None
	Min Test Voltage 30.60 V	F5	N	N	Box2-1	Pass
F6		N	N	Box2-2	Pass	None
F7		N	N	Box2-4	Pass	None
Test Ambient 19.5 °C	F8	N	N	Box2-5	Pass	None
	S3				No Data	Spare3
	S4				No Data	Spare4

Measurement Equipment Information (Calibration details available upon request)

Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 10
Overcharge System1	Overcharge Test Apparatus, 5 Channel, BOX2-35
Overcharge System2	Overcharge Test Apparatus, 5 Channel, BOX2-35