



Certificate of Compliance

Certificate/test data report number: R7-1495

Issue date: March 28, 2019

The following product(s) have been evaluated and tested to ensure compliance with the UN Manual of Tests and Criteria, Sixth Revised Edition Amendment 1, Sub-Section 38.3. Specific test methods are outlined in the UN report. Additional test details are available upon request. The test results listed relate only to the samples tested. Product specifications that are deviated from specified conditions may affect the outcome of the testing results.

Customer name:	Revel Propulsion LLC
Cust address:	240 E Hersey St., Suite 17
Cust city, state, zip:	Ashland, OR 97520
Cust part # (s):	BP7

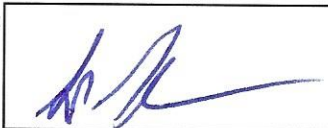
Manufacturer; part #:	BP7
Mfgr. address, Ph.#, email, website:	Revel Propulsion LLC, 240 E Hersey St., Suite 17, Ashland, OR 97520, 203-417-5565, info@revelpropulsion.com , www.revelpropulsion.com
Cell Manufacturer; part #:	LG Chem, INR18650-MJ1

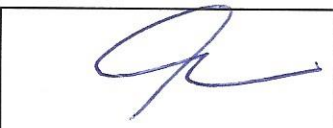
Product receipt date:	February 1, 2019
Condition of product:	Good

Tests Conducted / Results					
		P/F		P/F	
<input checked="" type="checkbox"/>	T1 Altitude simulation	Pass	<input checked="" type="checkbox"/>	T5 External short circuit	Pass
<input checked="" type="checkbox"/>	T2 Thermal test	Pass		T6 Impact / Crush (cells only)	N/A
<input checked="" type="checkbox"/>	T3 Vibration	Pass	<input checked="" type="checkbox"/>	T7 Overcharge (rechargeable batteries only)	Pass
<input checked="" type="checkbox"/>	T4 Shock	Pass		T8 Forced discharge (cells only)	N/A

Product Information					
Model Number(s)	Description	Mass (kg)	Wh Rating	Test Report Number	Test Report Date
BP7	204mm x 80mm x 57mm, Black with two 129mm wire leads with connector	~1.82	378	R7-1495	March, 28 2019
Energy Cube 378					

Test Result(s) is/are accredited and meet(s) the requirements of ISO/IEC 17025 as verified by the ANAB American National Accreditation Board.

Signature: 
Date: 3/28/2019
Typed name: Spencer Poff
Title: Engineering Manager

Signature: 
Date: 3/28/2019
Typed name: Emery Ingham
Title: Operations Manager

UN § 38.3 Rev. 6 testing for small secondary batteries (lithium)

Job # R7-1495
Task: T.1 Altitude Simulation

Testing location:	Mobile Power Solutions
Start date of test:	2/21/2019
End date of test:	2/21/2019
Test operator(s):	EI, AF, SG

*This test simulates air transport under low-pressure conditions.
≤ 11.6 kPa, 6 hours, 20 ± 5°C*

Acceptance criteria: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention ≥ 90%.

Event code legend
0: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention >=90%
1: leakage or mass loss > 0.1%
2: voltage retention < 90%
3: cell/battery vented as designed w/o rupture or disassembly
4: cell/battery ruptured w/o ejection of solid material
5: cell/battery ruptured w/ ejection of solid material
6: cell/battery ruptured or vented with spark or flame

Charge states
C1: 1st cycle, fully charged state
C25: 25 cycles, fully charged state
C25: 25 cycles, fully charged state

MPS ID #	Calibrated equipment	Cal. due
398	Voltmeter	2/13/2020
396	Scale	6/6/2019
60	Scale check weight	12/11/2021
302	Pressure gauge	5/2/2019
403/385	Lab monitor	12/10/2019
439	Timer	9/5/2019

MPS sample ID	Before test		After test		Mass loss % <small>100% × (M1-M2)/M1</small>	Voltage retention (%) <small>100% × V2/V1</small>	Event codes	Verdict	Comments
	Mass (g)	OCV (V)	Mass (g)	OCV (V)					
	M1	V1	M2	V2					
check weight	200.00		200.00						
R7-1495-C1-1	1817.01	41.664	1817.02	41.650	-0.001	99.966	0	Pass	
R7-1495-C1-2	1816.74	41.658	1816.75	41.643	-0.001	99.964	0	Pass	
R7-1495-C1-3	1823.94	41.653	1823.94	41.638	0.000	99.964	0	Pass	
R7-1495-C1-4	1816.62	41.444	1816.62	41.432	0.000	99.971	0	Pass	
R7-1495-C25-5	1814.31	41.684	1814.32	41.670	-0.001	99.966	0	Pass	
R7-1495-C25-6	1813.08	41.692	1813.08	41.678	0.000	99.966	0	Pass	
R7-1495-C25-7	1813.54	41.679	1813.55	41.665	-0.001	99.966	0	Pass	
R7-1495-C25-8	1817.67	41.575	1817.67	41.564	0.000	99.974	0	Pass	
check weight	200.00		200.00						

Notes: Condition of samples upon receipt: Good.

UN § 38.3 Rev. 6 testing for small secondary batteries (lithium)

Job # R7-1495
Task: T.2 Thermal test

Testing location:	Mobile Power Solutions
Start date of test:	2/21/2019
End date of test:	2/28/2019
Test operator(s):	EI, AF, SG

*This assesses cell and battery seal integrity and internal electrical connections.
The test is conducted using rapid and extreme temperature changes.*

72 ± 2°C for 6 hrs, 30 minute (or less) transition to -40 ± 2°C for 6 hours, repeat for a total of 10 cycles, store at ambient for 24 hrs before evaluation.

Acceptance criteria: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention ≥ 90%.

Event code legend
0: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention >=90%
1: leakage or mass loss > 0.1%
2: voltage retention < 90%
3: cell/battery vented as designed w/o rupture or disassembly
4: cell/battery ruptured w/o ejection of solid material
5: cell/battery ruptured w/ ejection of solid material
6: cell/battery ruptured or vented with spark or flame

Charge states
C1: 1st cycle, fully charged state
C25: 25 cycles, fully charged state
C25: 25 cycles, fully charged state

MPS ID #	Calibrated equipment	Cal. due
398	Voltmeter	2/13/2020
396	Scale	6/6/2019
60	Scale check weight	12/11/2021
402	Temperature logger	2/12/2020
413	Temperature logger card	2/12/2020

MPS sample ID	Before test		After test		Mass loss % <small>100% × (M1-M2)/M1</small>	Voltage retention (%) <small>100% × V2/V1</small>	Event codes	Verdict	Comments
	Mass (g)	OCV (V)	Mass (g)	OCV (V)					
	M1	V1	M2	V2					
check weight	200.00		200.00						
R7-1495-C1-1	1817.02	41.650	1816.73	40.856	0.016	98.094	0	Pass	
R7-1495-C1-2	1816.75	41.643	1816.49	40.861	0.014	98.122	0	Pass	
R7-1495-C1-3	1823.94	41.638	1823.29	40.874	0.036	98.165	0	Pass	
R7-1495-C1-4	1816.62	41.432	1816.37	40.799	0.014	98.472	0	Pass	
R7-1495-C25-5	1814.32	41.670	1813.96	40.901	0.020	98.155	0	Pass	
R7-1495-C25-6	1813.08	41.678	1812.71	40.861	0.020	98.040	0	Pass	
R7-1495-C25-7	1813.55	41.665	1813.18	40.882	0.020	98.121	0	Pass	
R7-1495-C25-8	1817.67	41.564	1817.33	40.845	0.019	98.270	0	Pass	
check weight	200.00		200.00						

Notes:

UN § 38.3 Rev. 6 testing for small secondary batteries (lithium)

Job # R7-1495
Task: T.3 Vibration

Testing location:	Mobile Power Solutions
Start date of test:	2/28/2019
End date of test:	3/5/2019
Test operator(s):	EI, SG

This test simulates vibration during transport.

Vibration profile: sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes.

Repeat this cycle 12 times for a total of 3 hours for each of 3 mutually perpendicular mounting positions of the sample(s).

Event code legend
0: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention >=90%
1: leakage or mass loss > 0.1%
2: voltage retention < 90%
3: cell/battery vented as designed w/o rupture or disassembly
4: cell/battery ruptured w/o ejection of solid material
5: cell/battery ruptured w/ ejection of solid material
6: cell/battery ruptured or vented with spark or flame

Charge states
C1: 1st cycle, fully charged state
C25: 25 cycles, fully charged state
C25: 25 cycles, fully charged state

MPS ID #	Calibrated equipment	Cal. due
398	Voltmeter	2/13/2020
396	Scale	6/6/2019
60	Scale check weight	12/11/2021
36	Vibration accelerometer	9/12/2019
421	Accelerometer control board and computer	2/12/2020
440	Timer	9/5/2019

MPS sample ID	Before test		After test		Mass loss % <small>100% × (M1-M2)/M1</small>	Voltage retention (%) <small>100% × V2/V1</small>	Event codes	Verdict	Comments
	Mass (g)	OCV (V)	Mass (g)	OCV (V)					
	M1	V1	M2	V2					
check weight	200.00		200.00						
R7-1495-C1-1	1816.73	40.856	1816.77	40.815	-0.002	99.900	0	Pass	
R7-1495-C1-2	1816.49	40.861	1816.53	40.830	-0.002	99.924	0	Pass	
R7-1495-C1-3	1823.29	40.874	1823.27	40.841	0.001	99.919	0	Pass	
R7-1495-C1-4	1816.37	40.799	1816.42	40.752	-0.003	99.885	0	Pass	
R7-1495-C25-5	1813.96	40.901	1814.00	40.865	-0.002	99.912	0	Pass	
R7-1495-C25-6	1812.71	40.861	1812.76	40.831	-0.003	99.927	0	Pass	
R7-1495-C25-7	1813.18	40.882	1813.22	40.849	-0.002	99.919	0	Pass	
R7-1495-C25-8	1817.33	40.845	1817.36	40.814	-0.002	99.924	0	Pass	
check weight	200.00		200.00						

Notes:

UN § 38.3 Rev. 6 testing for small secondary batteries (lithium)

Job # R7-1495
Task: T.4 Shock

Testing location:	Mobile Power Solutions
Start date of test:	3/5/2019
End date of test:	3/8/2019
Test operator(s):	EI, SG

This test simulates possible impacts during transport.

Shock profile: half sine shock of peak acceleration up to 150 g and pulse duration of at least 6 ms, depending on mass.

Three shocks in the (+) direction followed by three shocks in the (-) direction in each of three mutually perpendicular mounting positions for a total of 18 shocks.

Acceptance criteria: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention \geq 90%.

Event code legend
0: no mass loss, no leakage, no venting, no disassembly, no rupture, no fire, and voltage retention \geq 90%
1: leakage or mass loss > 0.1%
2: voltage retention < 90%
3: cell/battery vented as designed w/o rupture or disassembly
4: cell/battery ruptured w/o ejection of solid material
5: cell/battery ruptured w/ ejection of solid material
6: cell/battery ruptured or vented with spark or flame

Charge states
C1: 1st cycle, fully charged state
C25: 25 cycles, fully charged state
C25: 25 cycles, fully charged state

MPS ID #	Calibrated equipment	Cal. due
398	Voltmeter	2/13/2020
396	Scale	6/6/2019
60	Scale check weight	12/11/2021
294	Shock accelerometer	2/11/2020
438	Accelerometer control board and computer	8/20/2019

MPS sample ID	Before test		After test		Mass loss % $100\% \times (M1-M2)/M1$	Voltage retention (%) $100\% \times V2/V1$	Event codes	Verdict	Comments
	Mass (g) M1	OCV (V) V1	Mass (g) M2	OCV (V) V2					
check weight	200.00		200.00						
R7-1495-C1-1	1816.77	40.815	1816.84	40.801	-0.004	99.966	0	Pass	
R7-1495-C1-2	1816.53	40.830	1816.60	40.815	-0.004	99.963	0	Pass	
R7-1495-C1-3	1823.27	40.841	1823.31	40.825	-0.002	99.961	0	Pass	
R7-1495-C1-4	1816.42	40.752	1816.49	40.738	-0.004	99.966	0	Pass	
R7-1495-C25-5	1814.00	40.865	1814.07	40.848	-0.004	99.958	0	Pass	
R7-1495-C25-6	1812.76	40.831	1812.83	40.816	-0.004	99.963	0	Pass	
R7-1495-C25-7	1813.22	40.849	1813.30	40.833	-0.004	99.961	0	Pass	
R7-1495-C25-8	1817.36	40.814	1817.45	40.800	-0.005	99.966	0	Pass	
check weight	200.00		200.00						

Notes:

UN § 38.3 Rev. 6 testing for small secondary batteries (lithium)

Job # R7-1495
Task: T.5 External Short Circuit

Testing location:	Mobile Power Solutions
Start date of test:	3/11/2019
End date of test:	3/14/2019
Test operator(s):	EI, SG

This test simulates an external short circuit.

Soak sample at 57 ± 4°C (external case temp), then apply < 0.1 Ω load and hold for 1 hr after the external case temp returns to 57 ± 4°C, then observe for 6 hrs.

Acceptance criteria: external case temperature does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of test.

Event code legend
0: no disassembly, no rupture, no fire, cell/battery temperature did not exceed 170°C
3: cell/battery vented as designed w/o rupture or disassembly
4: cell/battery ruptured w/o ejection of solid material
5: cell/battery ruptured w/ ejection of solid material
6: cell/battery ruptured or vented with spark or flame
7: cell/battery external temperature exceeded 170°C

Charge states
C1: 1st cycle, fully charged state
C25: 25 cycles, fully charged state
C25: 25 cycles, fully charged state

MPS ID #	Calibrated equipment	Cal. due
399	Agilent DAQ	2/12/2020
386	Agilent card	12/10/2019
441	Timer	9/5/2019

MPS sample ID	Did case temperature exceed 170°C?	Any disassembly, rupture or fire within 6 hours?	Event codes	Verdict	Comments
R7-1495-C1-1	No	None	0	Pass	
R7-1495-C1-2	No	None	0	Pass	
R7-1495-C1-3	No	None	0	Pass	
R7-1495-C1-4	No	None	0	Pass	
R7-1495-C25-5	No	None	0	Pass	
R7-1495-C25-6	No	None	0	Pass	
R7-1495-C25-7	No	None	0	Pass	
R7-1495-C25-8	No	None	0	Pass	

Notes:

UN § 38.3 Rev. 6 testing for small secondary batteries (lithium)

Job # R7-1495
Task: T.7 Overcharge (batteries only)

Testing location:	Mobile Power Solutions
Start date of test:	3/14/2019
End date of test:	3/27/2019
Test operator(s):	EI, SG,SP

This test evaluates the ability of a rechargeable battery to withstand an overcharge condition. Charge each battery at 10 A to a minimum voltage of 50.4 V. Samples shall remain on test for 24 hours. Conduct a post-test inspection 7 days after test. Acceptance criteria: no disassembly and no fire within seven days of test.

Event code legend
0: no disassembly, no fire
3: cell/battery vented as designed w/o rupture or disassembly
4: cell/battery ruptured w/o ejection of solid material
5: cell/battery ruptured w/ ejection of solid material
6: cell/battery ruptured or vented with spark or flame
7: cell/battery external temperature exceeded 170°C

Charge states
C1: 1st cycle, fully charged state
C25: 25 cycles, fully charged state
C25: 25 cycles, fully charged state

MPS ID #	Calibrated equipment	Cal. due
401	Agilent DAQ	2/12/2020
410	Agilent card	2/12/2020
442	Timer	9/5/2019

MPS sample ID	Any disassembly or fire within seven days?	Event codes	Verdict	Comments
R7-1495-C1-1	None	0	Pass	
R7-1495-C1-2	None	0	Pass	
R7-1495-C1-3	None	0	Pass	
R7-1495-C1-4	None	0	Pass	
R7-1495-C25-5	None	0	Pass	
R7-1495-C25-6	None	0	Pass	
R7-1495-C25-7	None	0	Pass	
R7-1495-C25-8	None	0	Pass	

Notes: