UN38.3 Test Summary

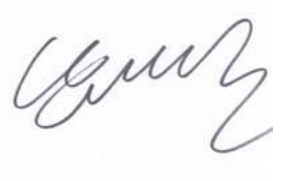
The following product has been evaluated according to the 6th revised edition of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.

Manufacturer's contact information	LG Chem, Ltd. Address : 128 Yeoui-Daero, Yeongdeungpo-gu, SEOUL, 150-721, REPUBLIC OF KOREA Telephone : +82-10-7742-5427 E-mail : kkammy@lgchem.com Website : www.lgchem.com
Test Laboratory information	LG Chem, Ltd. / RESEARCH PARK Address : 188 Munjiro, Yuseong-gu, Daejeon, 305-738, REPUBLIC OF KOREA Telephone : +82-10-4808-7362 E-mail : Milkis@lgchem.com Website : www.lgchem.com

Description		List of Test Completed		
Test Report Number	QDI-200908-B-SH128064P8S1	UN 38.3 Tests	Test 1. Altitude Simulation	Pass
Date of test report	2020. 09. 08		Test 2. Thermal Test	Pass
Item / Cell Type	Lithium ion Battery / Pouch		Test 3. Vibration	Pass
Model name	SH128064P8S1		Test 4. Shock	Pass
Nominal voltage	128.45 V		Test 5. External Short Circuit	Pass
Capacity / Energy	64.1 Ah / 8.225 kWh		Test 6. Impact or Crush	Pass
Weight	Max 66.0 kg		Test 7. Overcharge	N/A
Dimensions	147.0(L)*490.0(W)*798.4(H) mm		Test 8. Forced Discharge	Pass

Reviewed By: MinJe Woo
Professional
Global Standard Certification Team
LG Chem, Ltd.
E-mail: Milkis@lgchem.com

Approved By: DaeHo Nam
Team Leader
Global Standard Certification Team
LG Chem, Ltd.
E-mail: kkammy@lgchem.com



Document Number	QDI-200908-B-SH128064P8S1	
Prepared	MyeongHun Choi	
Reviewed	MinJe Woo	
Approved	DaeHo Nam	

UN38.3 Test Report

- SH128064P8S1 -

(64.1Ah, 128.45V)

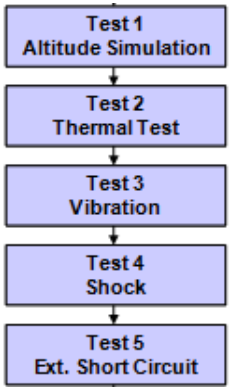
Index

2020. 09. 08

LG Chem

1. UN38.3 Test Condition

Rev.6 Amendment 1

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20±5℃	- After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) 1) If M<1g, less than 0.5%, 2) If 1g≤M≤75g, less than 0.2%, 3) If M>75g, less than 0.1%	T1~T5 : Sequence Tests 
Test 2. Thermal Test	[72±2℃,12hr ↔ -40±2℃, 12hr,interval max. 30min] x 10cycle , Storing at 20±5℃ for 24h		
Test 3. Vibration	[7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction 1) sinusoidal waveform with a logarithmic sweep 2) 7Hz 18Hz (maintaining 1gn) app. 25Hz (until 2gn) 200Hz (maintaining 2gn), 1.6mm total excursion		
Test 4. Shock	Half sine shock 1) Peak acceleration : 50gn or $\sqrt{\frac{30000}{Mass(kg)}}$gn 2) Pulse duration : 11msec 3) 6 direction (±x, y, z) x 3 cycle		
Test 5. External Short Circuit	1) Samples to be heated to 57±4℃ in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4℃ 3) 1hr continue after returning to 57±4℃ If this assessment is not feasible, the exposure time shall be at least 12hours	- No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170℃	
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	- No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170℃	for cylindrical cells (not less than 18mm diameter)
Test 6. Crush	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation		for cylindrical cells (less than 18mm diameter) for prismatic, pouch, coin/button cells
Test 8. Forced Discharge	Discharge at max. discharge current (connecting in series with 12V DC power supply), Duration time = rated capacity/initial test current	- No disassembly, no fire within 7 days after the test	Resistance of Electric Loader 1/Ω = (max. discharge current) / (12 + Initial OCV)

▪ Tests through T1-T5 shall be conducted in sequence with the same battery.

▪ Large battery means a lithium metal battery or lithium ion battery with a gross mass of more than 12 kg.

2-1. Test Result_T1~T4

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
NO.	OCV	Mass (kg)	After OCV (V)	Mass (kg)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (kg)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (kg)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (kg)	After OCV(%)	Mass Loss(%)	Result
A. 1st cycle, fully charged state																						
1	144.32	63.866	144.32	63.866	100.00	0.000	Pass	143.05	63.864	99.27	0.003	Pass	143.05	63.864	99.99	0.002	Pass	143.04	63.863	99.99	0.000	Pass
2	144.49	63.788	144.49	63.788	100.00	0.000	Pass	142.97	63.786	99.21	0.002	Pass	142.97	63.786	99.99	0.003	Pass	142.96	63.783	99.99	0.002	Pass
B. 25th cycle, fully charged state																						
3	144.52	63.799	144.52	63.799	100.00	0.000	Pass	143.40	63.787	99.34	0.017	Pass	143.40	63.787	99.99	0.003	Pass	143.38	63.784	99.99	0.002	Pass
4	144.51	63.807	144.51	63.807	100.00	0.000	Pass	143.48	63.807	99.38	0.000	Pass	143.45	63.807	99.99	0.006	Pass	143.43	63.803	99.99	0.000	Pass

2-2. Test Result_T5

EXT. Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle, fully charged state			
1	143.34	56.70	Pass
2	142.96	56.85	Pass
B. 25th cycle, fully charged state			
3	143.38	56.60	Pass
4	143.43	56.75	Pass

2-3. Test Result_T6&T8 (JH5)

Impact / Crush (T6)

A. 1st cycle, 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
11	3.689	26.90	Pass
12	3.686	25.90	Pass
13	3.689	25.70	Pass
14	3.687	25.70	Pass
15	3.689	23.10	Pass

Forced Discharge (T8)

A. 1st cycle, fully discharged state / B. 50th cycle, fully discharged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
21	3.451	67.90	Pass	31	3.417	71.80	Pass
22	3.451	76.10	Pass	32	3.418	73.70	Pass
23	3.450	72.30	Pass	33	3.416	72.60	Pass
24	3.450	67.30	Pass	34	3.400	74.50	Pass
25	3.453	70.80	Pass	35	3.414	71.60	Pass
26	3.453	70.80	Pass	36	3.413	71.00	Pass
27	3.453	67.80	Pass	37	3.409	76.10	Pass
28	3.452	71.60	Pass	38	3.405	71.80	Pass
29	3.451	75.70	Pass	39	3.406	69.50	Pass
30	3.452	73.80	Pass	40	3.401	68.50	Pass

3. Sample Image