LG Chem, Ltd.
128, Yeoui-daero, Yeongdeungpo-gu,
Seoul, Korea

Certification & Evaluation Team
Tel: 82-42-870-6195, Fax: 82-42-863-0182
If any of pages is not legible or has not been received,
please notify our office for re-transmission

CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5th revised edition Amendment2 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 and batteries and single cell batteries.

☐ Lithium-ion cell ☑ Lithium-ion battery ☐ Lithium-ion single cell battery	
Model name	**M4832P2B**
Cell Model name	**JH2**
Nominal voltage	**51.8V**
Electric power capacity	**1.6kWh**

Conducted By: Dae Ho Nam

Manager
Certification & Evaluation
LG Chem, Ltd.
E-mail: kkammy@lgchem.com

Reviewed By: Byung Soo Kim

General Manager
Certification & Evaluation
LG Chem, Ltd.
E-mail: bskim@lgchem.com

문서번호	QAE-EF02-151016-PKM4832P2B	
Prepared	최명훈	
Reviewed	남대호	
	이재승	
Approved	김병수	

SolutionPartner

UN Test Report
-M4832P2B(Nom. 51.8V)-

Contents

2015. 10. 16

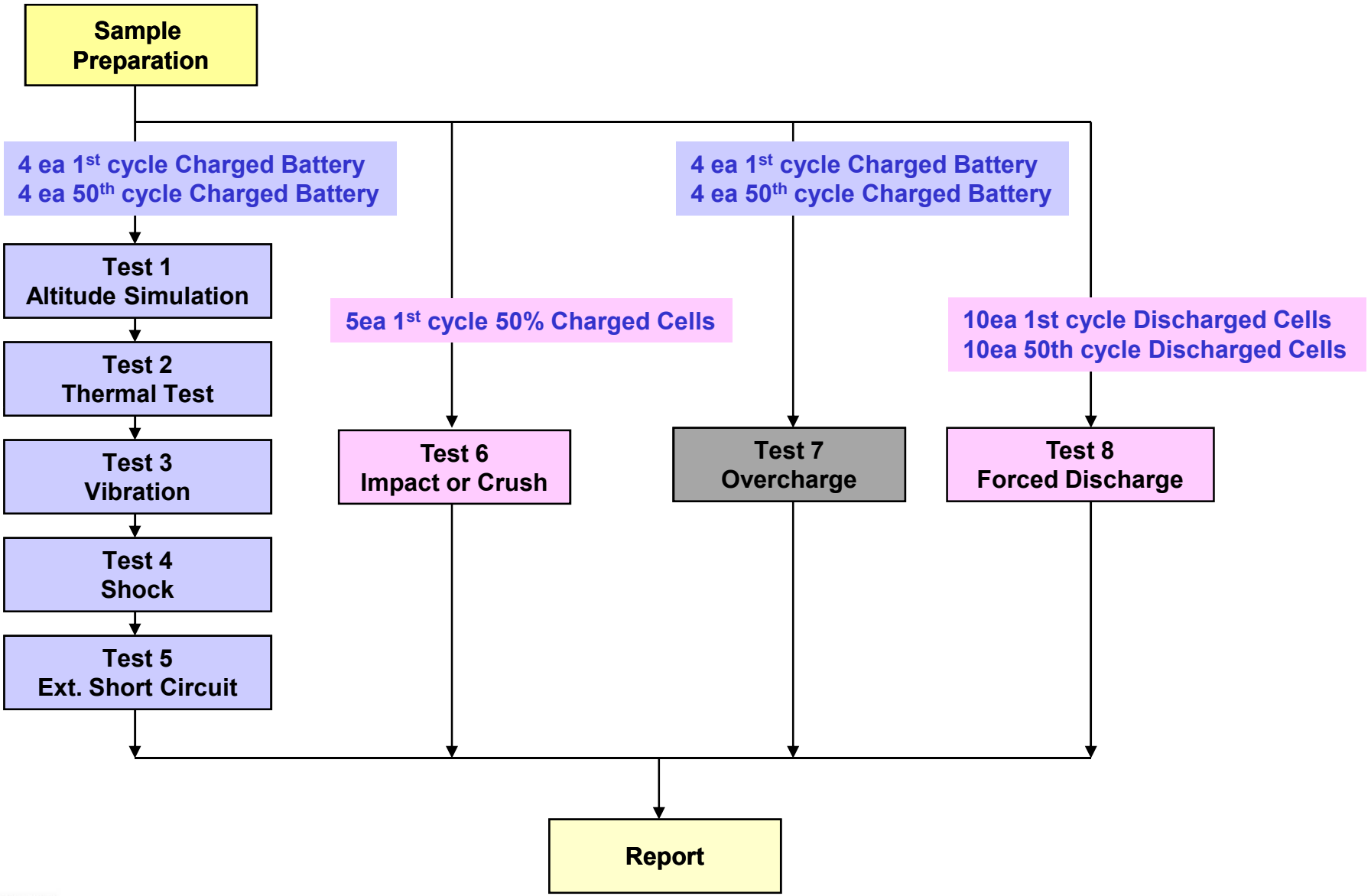
LG Chem

1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test (If M<1g, less than 0.5%, If 1g≤M≤75g, less than 0.2%, If M>75g, less than 0.1%) - Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	*Small cells and small batteries [72±2℃,6hr ↔ -40±2℃,6hr,interval max. 30min] x 10cycle , Storing at 20±5℃ for 24h	
Test 3. Vibration	* Cells and small batteries(Not more than 12Kg) [7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction 1) sinusoidal waveform with a logarithmic sweep 2) 7Hz~18Hz (maintaining 1gn) app. 50Hz (until 8gn) 200Hz (maintaining 8gn), 1.6mm total excursion	
Test 4. Shock	* Cells and small batteries(Not more than 12Kg) Half sine shock (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z), direction x 3 cycle	
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
Test 6. Impact for cylindrical cells (> 18mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
Test 6. Crush for cylindrical cells (≤ 18mm diameter) for prismatic, pouch, coin/button cells	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	
Test 7. Overcharge	Current = Manufacturer's recommended max. continuous charge current X 2 Voltage 1.If charge voltage ≤ 18V, V (min.) = 2 x (max. charge voltage) or V (min.) = 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	- Appearance picture before/ after test (after 7 days) - Temp. monitoring (max. 170℃)

- Tests through T1-T5 shall be conducted in sequence with the same battery.
- We declare that the above-mentioned test is the result of being checked according to UN Test (Manual of Test and Criteria ST/SG/AC.10/11/Rev.5/Amend.2)
- Large battery means a lithium metal battery or lithium ion battery with a gross mass of more than 12 kg.
- Large cell means a cell with a gross mass of more than 500 g.

2. Test Procedure



3-1. T1-T4 Test Result

Before				Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
	NO.	OCV	Mass	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result
A. 1st cycle fully charged state																							
Charge	**1**	58.71	10.50	58.30	10.50	99.30	0.000	**Pass**	57.61	10.50	98.82	0.000	**Pass**	57.52	10.50	99.84	0.000	**Pass**	57.45	10.50	99.87	0.000	**Pass**
	2	58.70	10.51	58.28	10.51	99.28	0.000	**Pass**	57.61	10.51	98.85	0.000	**Pass**	57.50	10.51	99.81	0.000	**Pass**	57.43	10.51	99.87	0.000	**Pass**
	3	58.72	10.50	58.29	10.50	99.27	0.000	**Pass**	57.66	10.50	98.93	0.000	**Pass**	57.60	10.50	99.88	0.000	**Pass**	57.51	10.50	99.85	0.000	**Pass**
	4	58.72	10.52	58.30	10.52	99.29	0.000	**Pass**	57.87	10.52	99.26	0.000	**Pass**	57.77	10.52	99.83	0.000	**Pass**	57.66	10.52	99.81	0.000	**Pass**
	Ave.	58.71	10.51	58.29	10.51	99.28	0.000	-	57.69	10.51	98.97	0.000	-	57.60	10.51	99.84	0.000	-	57.51	10.51	99.85	0.000	-
B. 50th cycle fully charged state																							
Charge	**5**	58.73	10.52	58.30	10.52	99.27	0.000	**Pass**	57.80	10.52	99.14	0.000	**Pass**	57.70	10.52	99.83	0.000	**Pass**	56.40	10.52	97.75	0.000	**Pass**
	6	58.73	10.50	58.30	10.50	99.27	0.000	**Pass**	57.40	10.50	98.46	0.000	**Pass**	57.11	10.50	99.49	0.000	**Pass**	56.80	10.50	99.46	0.000	**Pass**
	7	58.73	10.52	58.30	10.52	99.27	0.000	**Pass**	58.10	10.52	99.66	0.000	**Pass**	58.05	10.52	99.91	0.000	**Pass**	58.00	10.52	99.91	0.000	**Pass**
	8	58.73	10.46	58.30	10.46	99.27	0.000	**Pass**	58.10	10.46	99.66	0.000	**Pass**	58.03	10.46	99.88	0.000	**Pass**	58.00	10.46	99.95	0.000	**Pass**
	Ave.	58.73	10.50	58.30	10.50	99.27	0.000	-	57.85	10.50	99.23	0.000	-	57.72	10.50	99.78	0.000	-	57.30	10.50	99.27	0.000	-

Requirement	- Measuring mass before/after each test (If M>75g, less than 0.1%, 1g≤M≤75, less than 0. 2%, M<1g, less than 0.5%) - Measuring voltage before/after each test (more than 90%, only charged samples) - No leakage, no venting, no disassembly, no rupture, no fire

3-2. T5/T7 Test Result

EXT.Short Circuit (T5)				
	NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state				
Charge	1	57.45	55.60	Pass
	2	57.43	55.54	Pass
	3	57.51	55.52	Pass
	4	57.66	55.50	Pass
	MAX.	57.66	55.60	-

EXT.Short Circuit (T5)				
	NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully charged state				
Charge	5	56.40	55.17	Pass
	6	56.80	55.11	Pass
	7	58.00	55.23	Pass
	8	58.00	55.84	Pass
	MAX.	58.00	55.84	-

Test Condition
- 100mΩ ext. short-circuit at 55±2℃

Requirement
- Temperature ≤ 170 (℃) - No disassembly, no rupture, no fire within 6 hours after the test

3-3. T6/T8 Test Result(JH2)

Crush (T6)				
	NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charged state				
Flat	**1**	3.695	25.84	**Pass**
	2	3.695	25.39	**Pass**
	3	3.696	25.24	**Pass**
	4	3.695	25.33	**Pass**
	5	3.693	26.15	**Pass**
MAX.		3.696	26.15	-

Test Condition
- Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation

Requirement
- Temperature < 170 (℃)
- No disassembly, no fire within 6 hours after the test

Forced Discharge (T8)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully discharged state			
1	3.427	91.70	**Pass**
2	3.435	93.07	**Pass**
3	3.421	89.85	**Pass**
4	3.417	90.92	**Pass**
5	3.431	94.98	**Pass**
6	3.422	94.57	**Pass**
7	3.433	94.56	**Pass**
8	3.428	96.67	**Pass**
9	3.410	95.69	**Pass**
10	3.413	92.63	**Pass**
MAX.	3.435	96.67	-
B. 50th cycle fully discharged state			
1	3.396	72.38	**Pass**
2	3.406	79.50	**Pass**
3	3.386	90.54	**Pass**
4	3.406	93.04	**Pass**
5	3.416	90.38	**Pass**
6	3.412	92.65	**Pass**
7	3.392	94.77	**Pass**
8	3.407	93.48	**Pass**
9	3.407	91.63	**Pass**
10	3.401	94.53	**Pass**
MAX.	3.416	94.77	-

Test Condition
- Discharge at max. discharge current (with 12V DC power supply) : 60 A Duration time: rated capacity (30min)

Requirement
- No disassembly, no fire within 7 days after the test

4. Sample Image