Material Safety Data Sheet

1. Basic item
Product name Lithium ion battery ("Lithium ion battery" includes lithium polymer battery in this document)

2. Product information
Basic composition of the product
This product is a battery which consists of such main component as core battery pack assembled with some Lithium ion cells. And it consists of any combination of plastic casing, tube casing, protection circuit boards, safety devices and interface terminals.

3. Safety information
- Certifies the battery has passed and satisfied the UN Manual of Tests and Criteria Part III, sub-section 38.3 testing in Shipping.
- Manufactured the battery under the quality management program required in UN model

4. Battery pack
1. The Watt-hour rating of the battery is under than 100Wh.
2. Package of the battery satisfy the following conditions.
   (1) The product name “Lithium ion batteries” and how to deal with the damage of the package are written on the label.
   (2) The package has passed the drop test from the height of 1.2m.

5. The battery is not subject to the fully regulated requirements for Dangerous Goods in ocean and ground transportation.
Lenovo MSDS Finder

For more information, including how to locate your Lenovo FRU Part Number and what to do if your battery part number is not listed below, please visit:

<table>
<thead>
<tr>
<th>Battery Part Numbers</th>
<th>Battery Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo ASM Lenono PN Part Number</td>
<td>Lenovo FRU Part Number</td>
</tr>
<tr>
<td>5B10M55952</td>
<td>L16C4PB2</td>
</tr>
<tr>
<td>6B10F78999</td>
<td>01AV402</td>
</tr>
<tr>
<td>6B10K97594</td>
<td>01AV437</td>
</tr>
<tr>
<td>6F10K97591</td>
<td>01AV416</td>
</tr>
<tr>
<td>6F10Q98032</td>
<td>L17C3PG0</td>
</tr>
</tbody>
</table>

* Due to the unique cell configuration of this battery pack (hybrid battery pack with 4 cylindrical cells and 4 prismatic cells in the pack) please use both MSDS sheets referenced.

Last updated Jan 02, 2020
Safety Data Sheet

[29 CFR 1910.1200]

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Lithium Ion Rechargeable Battery Pack
Product Detail information: Refer Table “SDS_Murata”

MANUFACTURER: Celxpert(KunShan)Energy Co., Ltd
ADDRESS: NO.1111, Hanpu Road, Yushan Town, Kunshan City, Jiangsu Province, P.R. China
TELEPHONE: +86-512-57775999#2532
FAX: +86-512-5777-3839

SECTION 2: HAZARDS IDENTIFICATION

PROTENTIAL HEALTH EFFECTS

PRIMARY ROUTES OF ENTRY
Skin contact, Skin absorption, Eye contact, Inhalation, and Ingestion: NO

SYMPTOMS OF EXPOSURE
Skin contact
No effect under routine handling and use.
Skin absorption
No effect under routine handling and use.

Eye contact
No effect under routine handling and use.
Inhalation
No effect under routine handling and use.

SECTION 3: INGREDIENT

Battery Cell

<table>
<thead>
<tr>
<th>HAZARDOUS INGREDIENTS</th>
<th>%</th>
<th>CAS NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt compound</td>
<td>4-50</td>
<td>1307-96-6</td>
</tr>
<tr>
<td>Styrene-Butadiene-Rubber</td>
<td>&lt;1</td>
<td>27288-99-9</td>
</tr>
<tr>
<td>Aluminum Foil</td>
<td>2-10</td>
<td>7429-90-5</td>
</tr>
<tr>
<td>Polyvinylidene Fluoride (PVDF)</td>
<td>&lt;5</td>
<td>24937-79-9</td>
</tr>
<tr>
<td>Copper Foil</td>
<td>2-10</td>
<td>7440-50-8</td>
</tr>
<tr>
<td>Carbon</td>
<td>10-30</td>
<td>7440-44-0</td>
</tr>
<tr>
<td>Electrolyte (Ethylene carbonate)</td>
<td>10-20</td>
<td>96-49-1</td>
</tr>
<tr>
<td>Lithium hexafluorophosphate</td>
<td>&lt;5</td>
<td>21324-40-3</td>
</tr>
<tr>
<td>Stainless steel, Nickel and inert materials</td>
<td>Remainder</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Circuit Module

<table>
<thead>
<tr>
<th>HAZARDOUS INGREDIENTS</th>
<th>%</th>
<th>CAS NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>0.001</td>
<td>7439-92-1</td>
</tr>
<tr>
<td>Mercury</td>
<td>0</td>
<td>7439-97-6</td>
</tr>
<tr>
<td>Chromium</td>
<td>0</td>
<td>7440-47-3</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0</td>
<td>7440-43-9</td>
</tr>
<tr>
<td>Plastic case and Si2O</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Plastic Parts and Paints

<table>
<thead>
<tr>
<th>HAZARDOUS INGREDIENTS</th>
<th>%</th>
<th>CAS NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>&lt;0.1</td>
<td>7439-92-1</td>
</tr>
<tr>
<td>Nickle</td>
<td>&lt;0.01</td>
<td>7440-02-0</td>
</tr>
<tr>
<td>CFCs</td>
<td>0</td>
<td>75-69-4</td>
</tr>
<tr>
<td>Polychlorinated Biphenyls</td>
<td>0</td>
<td>1336-36-3</td>
</tr>
</tbody>
</table>

SECTION 4: FIRST AID MEASURES

INHALATION, EYE CONTACT, and SKIN CONTACT: Not a health hazard.

INGESTION
If swallowed, obtain medical attention immediately.

If exposure to internal materials within cell(pack) due to damaged outer casing, the following actions are recommended.

INHALATION
Leave area immediately and seek medical attention.
EYE CONTACT
Rinse eyes with water for 15 minutes and seek medical attention.

SKIN CONTACT
Wash area thoroughly with soap and water and seek medical attention.

INGESTION
Drink milk/water and induce vomiting; seek medical attention.

SECTION 5: FIRE FIGHTING MEASURES

5.1 GENERAL HAZARD
Cell is not flammable but internal organic material will burn if the cell is incinerated.
Combustion products include, but are not limited to hydrogen fluoride, carbon monoxide and carbon dioxide.

5.2 EXTINGUISHING MEDIA
Use extinguishing media suitable for the materials that are burning.

5.3 SPECIAL FIREFIGHTING INSTRUCTIONS
If possible, remove cell(s) from fire fighting area. If heated above 125°C, cell(s) can explode/vent.

5.4 FIREFIGHTING EQUIPMENT
Use NIOSH/MSHA approved full-face self-contained breathing apparatus (SCBA) with full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 ON LAND
Place material into suitable containers and call local fire/police department.

6.2 IN WATER
If possible, remove from water and call local fire/police department.

SECTION 7: HANDLING AND STORAGE
7.1 **HANDLING**
No special protective clothing required for handling individual cells.

7.2 **STORAGE**
Store in a cool, dry place.

### SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 **ENGINEERING CONTROLS**
Keep away from heat and open flame. Store in a cool dry place.

8.2 **PERSONAL PROTECTION**
Respirator: Not required during normal operations. SCBA required in the event of a fire.

Eye/face protection: Not required beyond safety practices of employer.

Gloves: Not required for handling of cells.

Foot protection: Steel toed shoes recommended for large container handling.

### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Solid</td>
</tr>
<tr>
<td>Boiling point</td>
<td>N/A</td>
</tr>
<tr>
<td>Odor</td>
<td>N/A</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Insoluble</td>
</tr>
<tr>
<td>PH</td>
<td>N/A</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>N/A</td>
</tr>
<tr>
<td>Density</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor density</td>
<td>N/A</td>
</tr>
<tr>
<td>Flash Point</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### SECTION 10: STABILITY AND REACTIVITY

10.1 **REACTIVITY**
None

10.2 **INCOMPATIBILITIES**
None during normal operation. Avoid exposure to heat, open flame, and corrosives.

10.3 **HAZARDOUS DECOMPOSITION PRODUCTS**
None during normal operating conditions. If cells are opened, hydrogen fluoride and carbon monoxide may be released.

10.4 CONDITIONS TO AVOID

Avoid exposure to heat and open flame. Do not puncture, crush or incinerate.

SECTION 11: TOXICOLOGICAL INFORMATION

This product does not elicit toxicological properties during routine handling and use.

Sensitization: NO  Teratogenicity: NO  Reproductive toxicity: NO  Acute toxicity: NO

This product does not contain any kinds of the following substances and halogen-type flame retardants including Chlorine and Bromide type harmful flame retardants which are listed in Appendix of TCO documents and relevant international ECO requirements:

Polybromated Biphenyls (PBB)
Polybromated Diphenylethers (PBDE)
Polychlorinated Biphenyls (PCBs)
Polychlorinated Terphenyls(PCTs)
Polychlorinated Paphthalene(PCN)
Chlorinated Paraffins(C10-C13)
Chlorofluorocarbons(CFCs)
Polyvinyl Chloride(PVC)
Carbon Tetrachloride

None of the following substances will be exposed, leaked, or emitted during transportation, storage or any operation and any temperature condition:

Chlorinated Fluorohydrocarbon (FCKW)
Acrylonitride
Styrol
Phenol
Benzol
Mercury of greater than 0.0001 wt% for alkaline battery
Mercury of greater than 0.0005 wt% for other battery
Lithium content of greater than 0.5g/battery cell
Cadmium, lead, and other harmful heavy metal

And will comply with the regulation of 49 CFR (DOT regulation), International Air Transport Association (IATA), and Deuche Forschungsgemeinschaft (DFG) regarding concentrations of emitted substances.

This product does not contain mercury and cadmium.

Mercury content: N/A

Cadmium content: N/A

If the cells are opened through misuse or damage, discard immediately. Internal components of cell are irritants and sensitizers.

SECTION 12: ECOLOGICAL INFORMATION

Some materials within the cell are bio-accumulative. Under normal conditions, these materials are contained and pose no risk to persons or the surrounding environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Disposal should be in accordance with local, state or national legislation.

SECTION 14: TRANSPORT INFORMATION


SECTION 15: REGULATORY INFORMATION

OSHA hazard communication standard (29 CFR 1910.1200)
### SECTION 16: OTHER INFORMATION

Package if damaged: do not load or transport.
Celxpert contact window: David Lee
For more information, call: +86-0512-57775999

### SECTION 17: UN MANUAL OF TEST CRITERIA

All battery pack models pass UN383 test and drop test.

<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Altitude Simulation (UN38.3-1)</td>
<td>1-1.4 batteries are standard charged. 4 batteries are 1C cycled 25 times, ending in fully charged state. All batteries weight is measured. The charged batteries voltage are measured and recorded. 1-2. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature 20±5℃. 1-3. Vacuum is released. All cells weight is measured. The charged cell voltage are measured and recorded.</td>
</tr>
<tr>
<td>T2</td>
<td>Thermal test (UN38.3-2)</td>
<td>2-1. Packs are stored for 6 hours at 72℃±2℃, followed by storage for 6 hours at -40℃±2℃. The maximum time interval between test temperature extremes is 30 minutes. 2-2. Repeat 2-1 for 10 times. Then store the packs at ambient for 24 hours. All packs weight are measured. The charged battery voltage are measured and recorded.</td>
</tr>
<tr>
<td>Item</td>
<td>Test Item</td>
<td>Test specification</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>---------------------</td>
</tr>
</tbody>
</table>
| T3   | Vibration test (UN38.3-3) | 3-1. Packs are firmly secured to the platform of the vibration machine without distorting the packs in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 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 3 mutually perpendicular to the terminal face.  
3-2. The logarithmic frequency sweep is as follows:  
- 7-18 Hz → 1gn  
- 18-50 Hz → 0.8mm amplitude  
- 50-200 Hz → 8gn  
3-3. All packs weight are measured. The charged packs voltage are measured and recorded. |
| T4   | Shock test (UN38.3-4) | 4-1. Packs shall be secured to the testing machine by means of a rigid mount, which will support all mounting surfaces.  
4-2. Packs shall be subjected to a half-sine shock of peak acceleration 150gn and pulse duration of 6 milliseconds. Each pack shall be subjected to 3 shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicularly mounting positions of the pack for a total of 18 shocks.  
4-3. All batteries weight are measured. The charged cell voltage are measured and recorded. |
| T5   | Short Circuit Test (UN38.3-5, | 5-1. Packs are placed in to a 57°C±4°C oven, and exterior packs temperature are monitored  
5-2. When packs exterior reach 57°C±4°C, they are shorted by connecting terminals with a copper wire of resistance less than 100 mOhm.  
5-3. The short was continued for more than 1hour or the cell temperature return to 57°C. The packs are observed for a further 6 hours. |
| T6   | Impact test (UN38.3-6) | 6-1. Cell’s diameter ≥ 18mm, Execution impact test. (A 9.1 Kg mass is to be dropped from a height of 61±2.5cm onto the sample.)  
6-2. Cell’s diameter < 18mm, Execution crush test (The cells are crushed with a 13 KN with the crush tester. Once the force is obtained it is to be released.) |
| T7   | Overcharge test (UN38.3-7) | 7-1. The charge current shall be twice the SPEC’s recommended maximum continuous charge current.  
7-2. The minimum voltage of the test shall be as follows:  
(a) When the SPEC’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 SPEC’s recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.  
7-3. Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours. |
| T8   | Forced discharge test-cell only (UN38.3-8) | 8-1. Cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current Specified by the manufacturer. |

Package Drop Test: Test specification: Height :120cm.