Amperex Technology Limited
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MATERIAL SAFETY DATA SHEET

Issue: 2019-A Doc No.: 2019-A-095 Issue Date: 12/28/2018

1. Product & Company Identification

Product Description	Lithium Ion Battery (Rechargeable type)	**ATL Model Name:**	91A5F0(AB2-17500mAh-51.8V)
Manufacturer	Amperex Technology Limited	**Approximate Weight:**	6000g
Capacity	17.5Ah	**Equivalent lithium content**	5.25g
Nominal voltage	51.8V	**Watt-hour**	906.5Wh
UN No.	UN3480/3481	**Proper Shipping Name**	Lithium Ion Battery
Address	3503,Wharf Cable TV Tower, 9 Hoi Shing Road,Tsuen Wan,N.T, HongKong China		
Telephone:	852-2498-0908	**Fax**	852-2498-1101

2. Hazardous Identification

2.1 CAS-No/EINECS NO.:N/A

INCI CTFA-Description: Lithium ion polymer rechargeable battery series.

2.2 The product is classified and labeled according to Regulation (EC) No 1272/2008

- Hazard pictograms

GHS05 GHS07 GHS08 GHS06

Signal word: Danger

·Hazard-determining components of labeling:

Cobalt lithium dioxide

Lithium Hexafluorophosphate(1-)

1,3-propanesultone

·Hazard statements

H314 Causes severe skin burns and eye damage.

H317 May cause an allergic skin reaction.

H351 Suspected of causing cancer.

·Precautionary statements

P101 If medical advice is needed, have product container or label at hand.

P102 Keep out of reach of children.

P103 Read label before use.

P260 Do not breathe dust/fume/gas/mist/vapors/spray.

P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER/doctor.

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazards:

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable

3. Composition /Information on Ingredients

Important note: The battery should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful.

3.1 PACK Composition

MATERIAL OR INGREDIENT	%/wt.
Container, Steel Support and Control System （Note: Non-dangerous chemical ）	35-45
Batteries（The composition of the battery reference to the following table 3.2.）	55-65

3.2 Composition of battery（Note: The percent in following table is only for the weight of battery）

MATERIAL OR INGREDIENT	CAS No. / EC No.	Chemical GHS safety label	%/wt.
Graphite	CAS# 7782-42-5 EC#231-955-3	substance with a Community workplace exposure limit	7-25

Cobalt lithium dioxide	CAS# 12190-79-3 EC#235-362-0	Carc. 2, H351; Skin Sens. 1, H317	15-40
Lithium Hexafluorophosphate(1-)	CAS# 21324-40-3 EC#235-362-0	Acute Tox. 3, H311; Skin Corr. 1B, H314; Acute Tox. 4, H302	0-5
Diethyl Carbonate	CAS# 105-58-8 EC#203-311-1	Flam. Liq. 3, H226	0-15
Propylene Carbonate	CAS# 108-32-7 EC#203-572-1	Eye Irrit. 2, H319	0-15
Ethylene Carbonate	CAS# 96-49-1 EC#202-510-0	Eye Irrit. 2, H319	0-15
1,3-propanesultone	CAS# 1120-71-4 EC# 214-317-9	Carc. 1B, H350; Acute Tox. 4, H302 Acute Tox. 4, H312	0-5
Copper	CAS#7440-50-8 EC#231-159-6	substance with a Community workplace exposure limit	10-12
Aluminum	CAS#7429-90-5 EC#231-072-3	substance with a Community workplace exposure limit	3-5
Nickel	CAS#7440-02-0（Ni） EC#231-111-4	substance with a Community workplace exposure limit	0-1

4. First Aid Measures

Under normal conditions of use, the battery is hermetically sealed.

Ingestion: Swallowing a battery can be harmful

Contents of an open battery can cause serious chemical burns of mouth, esophagus, and gastrointestinal tract. If battery or open battery is ingested, do not induce vomiting or give food or drink. Seek medical attention immediately.

Inhalation: Contents of an open battery can cause respiratory irritation. Inhalation of vapors may cause irritation of the upper respiratory tract and lungs. Provide fresh air and seek medical attention.

Skin Absorption: Ethylene carbonate, diethyl carbonate and dimethyl carbonate may be absorbed

through the skin causing localized inflammation.

Skin Contact: Contents of an open battery can cause skin irritation and/or chemical burns. Remove contaminated clothing and wash skin with soap and water. If a chemical burn occurs or if irritation persists, seek medical attention.

Eye Contact: Contents of an open battery can cause severe irritation and chemical burns. Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids, until no evidence of the chemical remains. Seek medical attention.

Note: Acetylene black and cobalt compounds are listed as possible carcinogens by the International Agency for Research on Cancer (IARC).

5. Fire Fighting Measures

5.1 **Risk Analysis (electrical shock, fire, explode, population)**

There was no electrical shock risk for single cell, or battery module which voltage was less than 50V DC (the safety voltage). But if the pack had the voltage was bigger than 50V DC, the electrical shock shall be protected.

During the shipment or testing process for LIB Pack or Module, there was danger factors like drop, crush, broken, metal short circuit, liquid immersion, the factors would lead the risk like electrical shock, catch fire. If pack was in well sealed box, there was gas exploding risk; if the pack was in big room or fans, there was not explode risk. The released liquid was the environment population risk.

5.2 **Material prepare & people training**

1） **Water based sprayer fire extinguish**: 1 set of 9L or 2 sets of 6L water spray fire extinguishers per each 500KWh LIB pack or Modules. Or you could use portable electrical water sprayer or hang type water spray fire extinguisher (photo 1). The water based spray fire extinguisher could be used for fire type ABCE = solid (A), flash point >60℃ liquid (B), gas (C), <36Kv electrical (E) fire. It was recommended to prepare water based sprayers in the trucks.

2） **Water protection sets**: raincoat, galoshes, and rubber gloves. Plastic rollers. Rags.

3） **PPE**: breathing mask, safety glass, face mask, gloves for high temperature.

4） **Smoke escape**: fans in wall one per 20m or portable fans in rooms. Keep gas exchange hole in trucks.

5） **Gases explode tools**: open condition for devices & rooms. Some devices like high or low temperature ovens must be sealed; there was one copper film with the diameter 200mm &

thickness 8um as the safety vent. The wall should have one fan per 20m, ≥5000m^3 per hour for flow rate.

6） **Neutralized material**: prepare 10kg $Ca(OH)_2$ powder per 500KWh LIB pack or modules, it was used for neutralized for release electrolyte. Because electrolyte met with water, 8% HF would be created.

7） **Voltage measure**. Multimeter. Please physical block the current measure function, the mistake would lead instrument exploding.

8） **People training**: (a) turn on fans or portable fans for smoke escape. (b) Wear the water protection sets → use water spray fire extinguishers → dry by cloths with rubber gloves → insulated by plastic film. (c) Neutralized by $Ca(OH)_2$ or NaOH for released electrolyte. (d) Use multimeter to measure voltage. Take care of the mistake.

5.3 **Fire Extinguisher Flow Chart**

1） Alarm if you found the smoking or burning.

2） Wear PPE. (Breath mask, face mask. If using water, PPE should include the raincoat, galoshes, and rubber gloves).

3） Turn Off power supply in devices or power supply.

4） Use any fire extinguishers for solid material fire, the recommended sequence was water or mist water, sand, fire extinguisher blanket, CO_2, powder.

5） Smoke Escape by turn on fans or open air environment.

6） Dry and neutralize. Drying by fans, Neutralization by $Ca(OH)_2$ powder if water was used.

Figure 1 water based fire extinguisher (Could be used for 36KV electrical fire)

Figure 2 water sprayers to fire extinguisher (Wear PPE to avoid electrical shock)

AMPEREX TECHNOLOGY LIMITED 新能源科技有限公司

6. Accidental Release Measures

On hand: Place material into suitable containers and call local fire/police department.

In water: Low electrical shock risk when EV or battery/pack in water, GM also shared the information. But H_2 gas was released by the electrolyzed water, you should keep good air flow to avoid the H_2 gas accumulated to prevent hydrogen explosion in enclosed space. If possible, remove from water and call local fire/police department.

7. Handling & Storage

One of the major risks associated with the transport of batteries and battery-powered equipment is short-circuit of the battery as a result of the battery terminals coming into contact with other batteries, metal objects, or conductive surfaces. Packaged batteries or cells must be separated in a way to prevent short circuits and damage to terminals. They must be packed in a strong outer packaging or be contained in equipment.

Handling: Do not expose the battery to excessive physical shock or vibration. Short-circuiting should be avoided; however, accidental short-circuiting for a few seconds will not seriously affect the battery. Prolonged short circuits will cause the battery to rapidly lose energy, could generate enough heat to burn skin. Sources of short circuits include jumbled batteries in bulk containers, coins, metal jewelry, metal covered tables, or metal belts used for assembly of batteries in devices. To minimize risk of short-circuiting, the protective case supplied with the battery should be used to cover the terminals when transporting or storing the battery. Do not disassemble or deform the battery. Should an individual cell within a battery become ruptured, do not allow contact with water. When operators handle the battery which voltage more than 50v, they must wear the insulation protection PPE.

Storage: The lithium ion battery should be between 25% and 75% of full charge when stored for a long period of time. Stored in a cool, dry, and well ventilated area. Elevated temperatures can result in loss of battery performance, leakage, or rust. Do not expose the battery to open flames.

8. Exposure Control/Personal Protection

8.1 Ingredients with limit values that require monitoring at the workplace:

7782-42-5 Graphite (20-25%)

AGW (Germany) VME (France)	Long-term value: 1,25* 10** mg/m ³ 2(II);*alveoleng ängig**einatembar; AGS, DFG Long-term value: 2 mg/m ³ pour la fraction alv éolaire
7440-50-8 Copper (10-12%)	
WEL(Britain) MAK(Germany) VME (France)	Short-term value: 2** mg/m ³ Long-term value: 0,2* 1** mg/m ³ *fume **dusts and mists (as Cu) Long-term value: 0,01 A mg/m ³als Cu Short-term value: 2** mg/m ³ Long-term value: 0,2* 1** mg/m ³ *fum ées **poussi ères, en CuPC-TWA: 0.2* 1** mg/m ³
21324-40-3 lithium hexafluorophosphate(1-) (5,0-8,0%)	
AGW (Germany)	Long-term value: 0,2 E mg/m ³ 1(I);Y, 10, als Li
7429-90-5 aluminium (3,0-5,0%)	
MAK (Germany) VME (France)	Long-term value: 1,5A 4E mg/m ³ vgl.Abschn.V f)+g) u. XII,*alveoleng.,**einatembar Long-term value: 5* 10** mg/m ³ *pulv érulent **m étal
1333-86-4 carbon black (2,0-3,0%)	
WEL(Britain) VME (France)	Short-term value: 7 mg/m ³ Long-term value: 3,5 mg/m ³ Long-term value: 3,5 mg/m ³

8.2 Personal Protection

Engineering Control: Keep away from heat and open flame. Stored in a cool dry place.

Personal Protection:

Respiratory Protection: Not necessary under normal conditions.

Eye/Face Protection: Not necessary under normal conditions. Wear safety glasses with side shields if handling an open or leaking battery.

Gloves: Not necessary under normal conditions. Use neoprene or natural rubber gloves if handling an open or leaking battery.

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

9. Physical/Chemical Properties

Physical state	Solid	Solubility in water:	Not Applicable
Color	Not Applicable	Vapor pressure	Not Applicable
Odor	No Odor	Explosion limit	Not Applicable
Flash point	Not Applicable	Auto flammability	Not Applicable
Solubility in ethanol soluble	Not Applicable	Melting Point	Not Applicable
Boiling Point	Not Applicable	Freezing Point	Not Applicable

10. Stability & Reactivity

Stability: Good stability at standard temperature.

Reactivity: None

Avoid contact with water and acids. Hazardous decomposition products: If Al package foil of battery is damaged, the battery should avoid to contact strong oxidizer, acids and high temperature, and the electrolyte will be formed HF.

11. Toxicological information

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

12. Ecological information

If the battery is scrapped, it should be selected and disposed by professional company.

13. Disposal considerations

Do not dispose of battery into environment or sewerage. It should be recycled and disposed basing on your local legislation and regulations.

14. Transport Information

14.1 The requirement of air transportation

The lithium battery should accord with the International Air Transport Association (IATA DGR 60edition) requirements for transportation. The battery or cell should be packed and signed as following table.（If the cell's power less than 20Wh or battery's power less than 100Wh and the package according with PI-965 to PI-967 SectionⅡ， it is not classified as dangerous cargo）.

UN NO.	Proper Shipping Name	Power	Package requirements	Label which need to paste
UN3480	lithium ion batteries	Cells＞20Wh Batteries＞100Wh	PI965 Section IA **Limit per package:** Pax A/C=Forbidden CAO ≤35 kg	Class9 lithium battery hazard label Cargo Aircraft Only label
		Cells≤20Wh Batteries≤100Wh	PI965 Section IB **NOTE: Use "IB" if package exceeds Section II Limits** **Limit per package:** Pax A/C=Forbidden CAO ≤10 kg	Class9 lithium battery hazard label lithium battery mark Cargo Aircraft Only label
		Cells≤20Wh Batteries≤100Wh	PI965 Section Ⅱ **Limit per package:** ≤2.7 Wh = 2.5kg; or cells ＞ 2.7 Wh ≤ 20 Wh = 8 cells; or batteries ＞ 2.7Wh ≤ 100 Wh = 2 batteries; Pax A/C=Forbidden	lithium battery mark Cargo Aircraft Only label
UN3481	Lithium ion batteries contained in equipment	Cells＞20Wh Batteries＞100Wh	PI967 Section I **Limit per package:** Pax A/C ≤5 kg CAO ≤35 kg	Class9 lithium battery hazard label
		Cells≤20Wh Batteries≤100Wh	PI967 Section Ⅱ **Limit per package:** Pax A/C ≤ 5 kg CAO ≤5 kg	lithium battery mark
UN3481	lithium ion batteries	Cells＞20Wh Batteries＞100Wh	PI966 Section I **Limit per package:**	Class9 lithium battery hazard label

	packed with equipment		Pax A/C ≤5 kg CAO ≤35 kg	
		Cells≤20Wh Batteries≤100Wh	PI966 Section Ⅱ **Limit per package:** Pax A/C≤5 kg CAO ≤ 5 kg	lithium battery mark

Cells and/or batteries at a SOC of greater than 30% of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Packages prepared according to SectionⅡof PI965 must be offered to the operator separately from other cargo and must not be loaded into a unit load device before being offered to the operator.

The lithium core and battery goods required by the packaging specification PI965 and PI968 II shall not be packed in the same outer package as other dangerous goods.

Ban lithium ion battery (UN 3480, PI965 Section IA or IB) and lithium batteries (3090, UN PI968 Section IA or IB) with category 1 explosive material (except ammunition) 1.4, 2.1 flammable gas, flammable liquid, 4.1 3 flammable solid, 5.1 class antioxidant and other dangerous goods packaging in the same package.

Do not damage or mishandle this package. If package is damaged, batteries must be quarantined, inspected, and repacked. Cells and batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport .Waste lithium batteries and lithium batteries being shipped for recycling or disposal are prohibited from air transport unless approved by the appropriate national authority of the State of origin and the State of the operator.

The lithium battery should pass the UN38.3 test, if the battery can not pass the testing, it can not transport, should redesign. If the batteries through the test, for the lithium battery only, follow the UN3480 and the packing requirements for PI965, for the lithium battery which installed in equipment, follow the UN3481 and the packing requirements for PI967.

The lithium battery testing meets all requirements under UN Manual of Tests and Criteria Part III, subsection 38.3.

No	ITEMS	RESULT	REMARKS
1	Altitude simulation	Pass	Test 1 to 5 must be conducted in sequence on the same cell or battery
2	Thermal test	Pass	
3	Vibration	Pass	
4	Shock	Pass	

5	External short circuit	Pass	
6	Impact	Pass	
7	Overcharge	Pass	
8	Forced Discharge	Pass	Only for Cell

14.2 The requirement of ocean shipping

According to International Maritime Dangerous Goods Code (IMDG 38th) to transport and according to the requirements of UN NO. 3480/3481 to management the goods, and require class II packaging. Firmly installation. Mutual isolation. Avoid short circuits. If the package contain more than 24 lithium batteries or more than 12 lithium battery packs, must provide the special program if package damage.

The clause 188 of IMDG require the Watt of lithium ion cell less than 20Wh is not classified as dangerous cargo and the Watt of lithium ion battery less than 100Wh is not classified as dangerous cargo but need marked the WHR ratio label. Otherwise, the battery and module should packed in a strong outer packaging or be contained in equipment.

The clause 230 of IMDG 38th requires the lithium battery testing should meets all requirements under UN Manual of Tests and Criteria Part III, subsection 38.3.

For more information, Call: +86-769-88989338.

15. Regulatory Information

See ACGIH exposure limits information as noted in Section3

US: This MSDS meets/exceeds OSHA requirements.

International: This MSDS conforms to European Union (UN), the International Standards Organization (ISO) and the International Labor Organization (ILO) and as documental in ANSI (American National Standards Institute) Standard Z400.1-2010.

Air transportation: According to Civil aviation industry standard MH/T1020-2018Lithium Battery Air Transport Standard and IATA DGR and ICAO. The international transport and commodity inspection is used this standard at the moment (IMDG CODE),

Ocean shipping： According to International Maritime Dangerous Goods Code to transport and According to the requirements of UN NO 3480/3481 to management the goods.

Land transportation： According to List of Dangerous Goods(GB12268).

Avoid electrical shock： According to Standard for Electrical Safety in the Workplace, NFPA-70E.

16. Charging and labeling

Charging: This battery is made to be charged many times. Use an Energizer approved battery charger. Never use a modified or damaged battery charger. A backup charge termination based on time is recommended to prevent overcharging. The charging temperature should be between 0 °C and 45 °C (32 °F and 113 °F). The battery pack will be normally warm during charging.

Charging Voltages and Currents: Charging voltages are prevented from exceeding the specified limits by an internal battery protection circuit. Never use a battery that shows signs of a damaged protection circuit or broken case. (Such damage to the protection circuit may be indicated by voltages at the battery terminals outside of their specified ranges.) Adhere to all specified charging and discharging voltages and currents. Do not use battery if its voltage drops below the specified minimum voltage.

Labeling: If the ATL label or package warnings are not visible, it is important to provide a package and/or device label stating.

If the lithium-ion battery or cell transported by air the labeling according the requirement of IATA 60th, the packages bear the Class 9 lithium battery hazard label (**Figure 3**) or/and lithium battery mark(**Figure 4**).

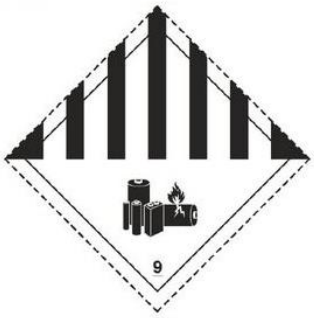

Figure 3 Class9 lithium battery hazard label

Figure 4 Lithium battery mark

If the lithium-ion battery or cell transported by sea the labeling according to IMDG 38th, the requirement as follow,

- Package, do not any indication.
- Need all the UN No.
- subassembly：Do not any indication.
- Need the *LQ* label.

WARNING: CHARGE ONLY WITH SPECIFIED CHARGERS ACCORDING TO DEVICE MANUFACTURER'S INSTRUCTIONS. DO NOT OPEN BATTERY, DISPOSE OF IN FIRE, OR

SHORT CIRCUIT - MAY IGNITE, EXPLODE, LEAK, OR GET HOT CAUSING PERSONAL INJURY.

Disposal: Dispose in accordance with all applicable federal, state and local regulations.

The information contained herein is furnished without warranty of any kind. Users should consider this data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information form all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

物料安全技术说明书(MSDS)

1. 化学品及企业标识

产品类型	锂离子电池 (可充电型)	**ATL 产品型号**	91A5F0(AB2-17500mAh-51.8V)
制造商	新能源科技有限公司	**约计重量**	6000g
容量	17.5Ah	**当量锂含量**	5.25g
标称电压	51.8V	**瓦时数**	906.5Wh
UN 号	UN3480/3481	**运输名称**	锂离子电池
地址	香港新界荃湾海盛路 9 号有线电视大楼 35 楼 3 号单元		
电话	852-2498-0908	**传真**	852-2498-1101

2. 危险性概述

2.1 美国化学文摘号/欧洲现有化学品目录号：无

国际标准化学名：可充电式锂离子电池

2.2 本产品根据欧盟法规 (EC) No. 1272/2008 进行了分类及标记。

• 图 示

GHS05 GHS07 GHS08 GHS06

• 信号词: 危险

• 标签上辨别危险的成份：

钴酸锂

六氟磷酸锂

1,3 丙烷磺酸内酯

• 危险字句

H314 引起严重的皮肤灼伤和眼睛损伤

H317 可能引起皮肤过敏性反应

H351 怀疑致癌

• 防范说明

P101 如需医嘱：请将产品容器或标签备放在手边。

P102 放在儿童伸手不及之处。

P103 使用前请读标签。

P260 不要吸入粉尘/烟/气体/烟雾/蒸气/喷雾。

P303+P361+P353 如皮肤(或头发)沾染：立即脱掉所有沾染的衣服。用水清洗皮肤/淋浴。

P305+P351+P338 如进入眼睛 ： 用水小心冲洗几分钟 。 如戴隐型眼镜并可方便地取出 ， 取出隐型眼镜。继续冲洗。

P310 立即呼叫解毒中心/医生

P405 存放处须加锁。

P501 按照本地 / 地区 / 国家 / 国际规例处理内含物 / 容器。

2.3 其它危害：

PBT (残留性、生物浓缩性、毒性物质) 及 vPvB (高残留性、高生物浓缩性物质) 评价结果

PBT (残留性、生物浓缩性、毒性物质)：不适用的

vPvB (高残留性、高生物浓缩性物质)：不适用的

3. 成分/组成信息

重要提示：电池不能拆开或燃烧，暴露电池中所在成分或燃烧产物是有害的。

3.1 PACK 成分表

成分	重量百分比
集装箱、金属支架及控制系统（非危险化学品）	35-45
电池（电池成分见下表 3.2）	55-65

3.2 电池成分表（注：下表的重量百分比仅针对电池重量）

原料或配料	CAS No. / EC No.	化学品 GHS 安全标签	重量百分比
石墨	CAS# 7782-42-5 EC#231-955-3	在工作场所中有暴露限值的物质	7-25
钴酸锂	CAS# 12190-79-3 EC#235-362-0	Carc. 2, H351; Skin Sens. 1, H317	15-40
六氟磷酸锂	CAS# 21324-40-3 EC#235-362-0	Acute Tox. 3, H311; Skin Corr. 1B, H314;	0-5

		Acute Tox. 4, H302	
碳酸二乙酯	CAS# 105-58-8 EC#203-311-1	Flam. Liq. 3, H226	0-15
碳酸丙烯酯	CAS# 108-32-7 EC#203-572-1	Eye Irrit. 2, H319	0-15
碳酸亚乙酯	CAS# 96-49-1 EC#202-510-0	Eye Irrit. 2, H319	0-15
1,3 丙烷磺酸内酯	CAS# 1120-71-4 EC# 214-317-9	Carc. 1B, H350; Acute Tox. 4, H302 Acute Tox. 4, H312	0-5
铜箔	CAS#7440-50-8 EC#231-159-6	在工作场所中有暴露限值的物质	10-12
铝箔	CAS#7429-90-5 EC#231-072-3	在工作场所中有暴露限值的物质	3-5
镍	CAS#7440-02-0（Ni） EC#231-111-4	在工作场所中有暴露限值的物质	0-1

4. 急救措施

在常规条件下使用，电池是密封的

摄取：摄入电池是有害的

电池的成分可以导致嘴、食道、胃肠道严重的化学烧伤，如果摄入电池或拆开的电池，不要诱导呕吐或吃食物或饮料。应立刻就医。

吸入：电池里的成分可能会引起呼吸道过敏，吸入蒸汽可能引起上呼吸道和肺过敏。应马上呼吸新鲜空气并就医。

皮肤吸收：碳酸亚乙酯、碳酸二乙酯、碳酸二甲酯可能会通过皮肤吸收导致局部炎症。

皮肤接触：电池里的成分可能会引起皮肤过敏或化学烧伤。消除污染的衣物并用肥皂和水清洗皮肤，如果发上化学烧伤或持续刺激，立刻就医。

眼睛接触：电池里的成分可能会引起严重的过敏和化学烧伤。立刻翻开上下眼睑，用清水冲洗眼睛 15 分钟以上，直到没有化学物质残留。然后立刻就医。

注意：乙炔炭黑和钴化合物被国际癌症研究机构列为可能致癌的物质。

5. 消防措施

5.1 危险特性：触电、起火、爆炸、污染

单个电芯、电池组的电压也小于 50V（安全电压），没有电击的风险，如果电池组的电压大于 50V，那么就应该控制电击的发生。

在运输和测试工程，可能发生电箱跌落、挤压、刺破、金属短路、液体浸泡等危险因子，可能发生触电、起火风险；如果在密闭空间，可能有气体爆炸风险，通风良好或者敞开空间，不会有气体爆炸；事故泄露的液体，包括消防水处理不当有污染环境的风险。

5.2 物资准备和人员训练

1） 水雾灭火器： 每 500KWH 有 1 个 9 升的水基型水雾灭火器或者 2 个 6 升的水基型水雾灭火器，可扑灭 ABCE 类火灾（固体、非易燃液体、气体、低于 36KV 的电气火灾）。或者携带电动喷雾器、手动喷雾器当水雾灭火器。车俩货物上方可悬挂悬挂式水基灭火器。

2） 防水用品：雨衣、雨靴、橡胶手套；保鲜膜；抹布。

3） 个人保护用品（PPE）：口罩、高温手套，安全眼镜，半面罩。

4） 排烟工具： 每 20 米 1 个墙壁排烟风机，或移动排烟风机。车辆有通风孔。

5） 防爆工具： 保持敞开，如开放环境，车辆/设备不密闭。 测试中一定要密闭的设备如高温炉、高低温冲击测试仪器等，设备上要放置直径 200 毫米的厚度 8 微米的铜箔当泄压膜，房间墙壁每 20 米要 1 个风机，风机排量至少每小时 5000 立方米。

6） 中和物资：每 500KWH 准备 10 公斤石灰粉末用于中和流出的电解液，电解液遇到水会按照重量的 8%形成 HF, 要用碱性物资中和。

7） 电压测量：万用表。 物理密封住电流档，避免误操作仪表爆炸。

8） 训练技能：

a） 开启风机或者移动风机排烟；

b） 穿戴防水用具后用水雾灭火器灭火，灭火后晾干或者待手套抹干，测量电压正常，缠绕保鲜膜绝缘，再运输处理；

c） 对泄漏的电解液以重量的 8%比例洒石灰、或者 NaOH 粉末中和液体；

d） 会用万用表测试电压， 特别留意别用错档位（要物理封闭电流挡），防仪表爆炸。

5.3 灭火流程

1） 发现电池冒烟或燃烧时立即报警；

2） 穿着防护用品，包括呼吸器、口罩，如果用水还应包括雨衣、雨鞋、绝缘手套等

3） 切断电源；

4） 使用固体类灭火器材，推荐按以下顺序使用灭火器材：水或水雾沙灭火毯、干粉、二氧化碳灭火器；

5） 通过风扇或空气流通排烟；

6） 干燥、中和。通过风扇干燥，如果使用了水用氢氧化钙中和。

图片 1 水基灭火器
(可使用灭 36KV 下的电气火灾)

图片 2 水雾灭火器
(穿着 PPE 防止触电)

6. 泄露应急处理

现场：将物质置于合适在容器中，然后向当地警方报警。

在水中：当电池组在水中时，有微弱电击的风险；在电解水时会产生氢气，必须保持通风以防止氢气集聚，防止氢气在密闭空间爆炸。如果可以，将电池或模组从水中拿出然后向当地警方报警。

7. 操作处置与储存

电池和电池动力设备运输时，最主要的风险之一就是电池两极接触其他电池、金属物体或其他导电体而引起的电池短路。因此，必须将包装好的电池芯和电池使用适当的方式隔开，以防止发生短路和电极破损。此外，电池和电池芯还必须包装在坚固的外包装内，或者安装在设备中。

操作注意事项：请勿对电池进行过度的物理冲击或振动。应避免短路，虽然几秒钟在短路不会对电池造成严重的影响。长时间的短路会导致电池迅速失去能量，可以产生足够的热量将外壳烧着。短路的来源包括将电池胡乱放在在散装容器中、或在设备上进行电池装配时使用的各种金属物品。为了将电池短路的风险降低到最小，那么在电池运输和存储时，应该提供电池的保

护措施。不能将电池拆解或使电池变形。电芯破裂时，不要将其接触到水。操作处理超过 50V 的电池组时，操作人员需要绝缘防护。

储存注意事项：当锂离子电池长时间储存时，其充电容量应在 25% 和 75%之间。应储存在干燥凉爽且通风较好的区域。温度过高会导致电池发生一系列的问题，如泄漏或生锈。请勿将电池置于明火中。

8. 接触控制/个体防护

8.1 在工作场所需要限值监控的成份：

7782-42-5 石墨 (20-25%)	
AGW (DE)	PC-TWA: 1.25* 10** mg/m³ 2(II);*alveoleng ängig**einatembar; AGS, DFG
VME (F)	PC-TWA: 2 mg/m³ pour la fraction alv éolaire
7440-50-8 铜 (10-12%)	
WEL (GB)	PC-STEL: 2** mg/m³ PC-TWA: 0.2* 1** mg/m³ *fume **dusts and mists (as Cu)
MAK (DE)	PC-TWA: 0.01 A mg/m³ als Cu
VME (F)	PC-STEL: 2** mg/m³
21324-40-3 六氟磷酸锂 (5.0-8.0%)	
AGW (DE)	PC-TWA: 0.2 E mg/m³ 1(I);Y, 10, als Li
7429-90-5 铝 (3.0-5.0%)	
MAK (DE)	PC-TWA: 1.5A 4E mg/m³ vgl.Abschn.V f)+g) u. XII,*alveoleng.,**einatembar
VME (F)	PC-TWA: 5* 10** mg/m³ *pulv érulent **m étal
1333-86-4 炭黑 (2.0-3.0%)	
WEL (GB)	PC-STEL: 7 mg/m³ PC-TWA: 3.5 mg/m³
VME (F)	PC-TWA: 3.5 mg/m³

8.2 个人防护设备

工程控制：远离热源和明火。存储与干燥凉爽的区域

个人防护：

呼吸系统防护：正常条件下不需要防护

眼睛/脸部防护：正常条件下不需要防护。处理拆卸的或泄漏的电池，要佩戴有护边的安全眼镜。

手的防护：正常条件下不需要防护。处理拆卸的或泄漏的电池，应佩戴氯丁橡胶或天然橡胶手套。

脚的保护：在搬运大容器时，建议穿戴劳保鞋。

9. 理化特性

物理状态	固体	在水中的溶解度	不适用
颜色	不适用	蒸气压力	不适用
气味	无	爆炸极限	不适用
闪点	不适用	自燃性	不适用
在乙醇中的溶解度	不适用	熔点	不适用
沸点	不适用	凝固点	不适用

10. 稳定性和反应活性

稳定性：在标准温度下稳定性很好。

反应作用：无

不要接触到水或酸性物质，分解后产物：如果电池的铝箔包装破损，那么就不要接触强氧化剂、酸性物质和高温环境，且电解液可能挥发形成氟化氢。

11. 毒理学资料

在常规操作和使用时，不会产生有毒物质。

12. 生态学资料

如果电池要报废，那么应当由专业公司进行挑选和处理。

13. 废弃处置

不能直接将电池处理到下水道或知道排放到环境中，应当基于当地的法律法规基础上进行回收和处理。

14. 运输信息

14.1 空运要求

锂离子电池或电池芯应根据国际航空运输协会 IATA DGR 第 60 版相关要求进行运输。锂离子电池或电池芯按国际航空运输协会危险物品的规定，应依照下表要求进行包装和装贴标签（如果电芯小于 20Wh，电池小于 100Wh 且包装满足 PI-965 到 PI-967 第二部分的要求时，不属于危险物品。）。

UN 号	运输品	功率	包装要求	需粘贴的标签
UN3480	锂离子电池	电池芯＞20Wh 电池＞100Wh	PI965 Section IA 每个包装件限量： 客机禁运 全货机≤35kg	第 9 类危险性标签-锂电池 仅限货机标签
		电池芯≤20Wh 电池≤100Wh	PI965 Section IB 包装件超过 Section II 限制时使用 IB 每个包装件限量： 客机禁运 全货机≤10Kg	第 9 类危险性标签-锂电池 锂电池标记 仅限货机标签
		电池芯≤20Wh 电池≤100Wh	PI965 Section Ⅱ 每个包装件限量： ≤2.7Wh=2.5kg 或 电池芯＞2.7Wh 且≤20Wh=8 块电池芯 或 ≤100Wh=2 块电池 客机禁运	锂电池标记 仅限货机标签
UN3481	锂离子电池安装在设备中	电池芯＞20Wh 电池＞100Wh	PI967 Section I 每个包装件限量： 客机≤5kg 全货机≤35kg	第 9 类危险性标签-锂电池
		电池芯≤20Wh	PI967 Section Ⅱ	锂电池标记

		电池≤100Wh	每个包装件限量： 客机≤5kg 全货机≤5kg	
UN3481	锂离子电池与设备包装在一起	电池芯＞20Wh 电池＞100Wh	PI966 Section I 每个包装件限量： 客机≤5kg 全货机≤35kg	第 9 类危险性标签-锂电池
		电池芯≤20Wh 电池≤100Wh	PI966 Section Ⅱ 每个包装件限量： 客机≤ 5kg 全货机≤5kg	锂电池标记

如果电芯或电池的电荷载量大于 30%的荷电容量上限，需要获得在原产地和运营商主管当局批准。

符合包装说明 PI965 第Ⅱ节规定的包装件在提供给运营人之前，必须单独封装，而不能与其他货物混装。

符合包装说明 PI965 和 PI968 第II章节要求的锂电芯和电池货物不得与其它危险品装入同一个外包装中。

禁止锂离子电池（UN 3480, PI965 Section IA or IB）和锂金属电池（UN 3090, PI968 Section IA or IB）与包括第 1 类爆炸物质（除第 1.4 类弹药）、第 2.1 类易燃气体、第 3 类易燃液体、第 4.1 类易燃固体、第 5.1 类氧化剂等危险品货物包装在同一个外包装中。

不能损坏或错误处理电芯，如果电芯损坏，必须隔离、检查和重新包装。禁止运输被厂商确定为出于安全原因的缺陷，或已损坏，有潜在产生发热、着火或短路危险的电芯和电池；废锂电池和锂电池被运往回收或处理，禁止空运除非经起源国相关的国家机关批准。

锂离子电池需经过 UN38.3 测试，如果未通过该测试，则不能运输，需重新设计。若通过测试，则对于锂离子电池：遵循 UN3480，包装要求为 PI965。锂离子电池安装在设备中的：遵循 UN3481，包装要求为 PI967。

电池测试满足联合国手册中第三部分测试标准 38.3 部分的所有要求（如下表）。

编号	项目	结果	备注
1	高度模拟试验	通过	测试 1 到 5 必须用相同的电芯或电池按顺序进行
2	加热风险	通过	
3	震动	通过	
4	冲击	通过	
5	外短路	通过	
6	碰撞	通过	

7	过度充电	通过	
8	强制放电	通过	只针对电芯

14.2 海运要求

运输参考《国际海运危险货物规则》，按 UN NO 3480/3481 的要求管理，采用第二类包装。安装牢固，互相隔离，防止短路，装有多于 24 个锂电池或 12 个锂电池组的包件：须标记说明破损时遵守的特殊程序；随船备有一份破损时遵守的特殊程序说明文件.

《国际海运危险货物规则》188 条规定：对于锂离子电芯，瓦特-小时的额值不超过 20Wh, 不作为危险货物运输。对于锂离子电池（组）瓦特-小时比率不超过 100Wh 的不作为危险货物运输，但需在外壳标明及瓦特-小时值。除装在设备中外，电池和电池组须装在完全将其密封的内包装箱内，电池或电池组须加以防护以免发生短路。

《国际海运危险货物规则》230条规定：电池或电池组的类型应满足联合国《实验和标准手册》第三部分第38.3小节的每项试验要求。

获取更多信息，请拨打联系电话： +86-769-88989338。

15. 法规信息

法规信息：见 ACGIH 第三部分规定暴露限值信息。

美国：本物质安全数据资料符合 OSHAS 相关要求。

国际：本物质安全数据资料符合欧盟（联合国），国际标准化组织（ISO）和国际劳工组织（ILO）和美国（美国国家标准协会）标准 Z400.1-2010。

空运：参考民航行业规范 MH/T1020-2018《锂电池航空运输规范》与 IATA DGR、ICAO 的要求是一致的。目前国际运输及商检都是采用的这个标准。

海运：运输参考《国际海运危险货物规则》，按 UN NO 3480/3481 的要求管理。

陆运：参考《危险货物品名表》（GB12268-2012）

防触电：参照工作场所电气安全标准 NFPA-70E

16. 其他信息

充电：本电池可多次重复充电。请使用原装电池充电器。不要使用改装或损坏的电池充电器。当充电超过规定的充电时间可停止充电，来防止电池过充。充电温度应在 0℃-45℃ °，电池充电过程中有正常的发热现象。

充电电压和电流：当电压超过规定的值后受到电池内部保护电路限制。如果出现保护电路受损

情况，请停止使用。请在规定的电压和电流下充、放电。如果电池的电压下降到低于规定的最低电压时，请停止使用。

标识： 如果没有或看不清标签或包装上的警告时，请联系相关人员提供封装和设备标签说明。如果锂电池或电池芯使用空运，包装上根据 IATA 60th 相关要求粘贴第 9 类危险性标签（如图 3）或/和锂电池标记（如图 4）。

图 3：第 9 类危险性标签-锂电池

图 4：锂电池标记

如果锂电池或电池芯使用海运，包装上根据 IMDG 38th.相关要求如下

- 包件：不需任何标志；
- 不需正确运输名称；
- 需要所有的联合国编号；
- 组件：不需要标牌和标志；
- 需要标明“限量”字样。

警告： 应使用设备制造商提供的充电器并按操作指南使用。禁止将电池打开，靠近火源，以及短路，可能引起着火、爆炸、泄漏造成人身伤害。

处置： 依照联合国、国家、地方相应规程进行处置。

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