

Material Safety Data Sheet (MSDS)

SECTION I – PRODUCT AND MANUFACTURER INFORMATION

PRODUCT NAME: Fullwat Lithium-ion batteries

MODEL: **LIR18650;** **LIR18650-CI**

MANUFACTURER: UKAI, S.A.
 Ribera de Elorrieta 7C
 48015 Bilbao
 Vizcaya, Spain
 Telephone Number for Information: 34-944745252

SECTION II – COMPOSITION & INFORMATION ON COMPONENTS

<u>Component</u>	<u>Molecular Formula</u>	<u>Weight %</u>	<u>CAS N°</u>	<u>OSHA (PEL)</u>	<u>ACGIH(TLV)</u>
Lithium cobaltite	LiCoO ₂	35~38%	12190-79-3	N/A	N/A
Graphite powder	C	23~25%	7782-42-5	N/A	N/A
Electrolyte	LiPF ₆ C ₃ H ₄ O ₃ C ₃ H ₆ O ₃ C ₅ H ₁₀ O ₃	12~15%	21324-40-3 96-49-1 616-38-6 105-58-8	N/A	N/A
Polyethylene	(C ₂ H ₄) _n	0.5~1%	9002-88-4	N/A	N/A
Cooper	Cu	5~10%	7440-50-8	N/A	N/A
Nickel	Ni	2~3%	7440-02-0	N/A	N/A
Polyvinylidene fluoride	(C ₂ H ₂ F ₂) _n	0.5~2%	24937-79-9	N/A	N/A
Polypropylene	(C ₃ H ₆) _n	2~5%	9003-07-0	N/A	N/A
Steel	---	7~10%	---	N/A	N/A

Electrochemical system:

Negative Electrode: Carbon
 Positive Electrode: Lithium cobaltite (LiCoO₂)
 Electrolyte: Solution of lithium hexafluorophosphate (LiPF₆) in a mixture of organic solvents
 Nominal voltage: 3.7V
 Energy per cell: 8.1Wh
No more than 0.5g/pc lithium is contained

SECTION III – HAZARD DATA

The Lithium-Ion batteries described in this Material Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the Manufacturer.

Under normal conditions of use, the solid electrode materials and liquid electrolyte they contain are non-reactive provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) leading to the activation of safety valves and/or the rupture of the battery containers. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

SECTION IV – EMERGENCY AND FIRST AID INFORMATION

In case of battery rupture or explosion, evacuate personnel from contaminated area and provide maximum ventilation to clear out corrosive fumes/gases and pungent odour.

In all case, seek immediate medical attention.

Eye contact:	Flush with plenty of water (eyelids-held open) for at least 15 minutes.
Skin contact:	Remove all contaminated clothing and flush affected areas with plenty of water and soap for at least 15 minutes. Do not apply greases or ointments.
Ingestion:	Dilute by giving plenty of water and get immediate medical attention. Assure that the victim does not aspirate vomited material by use of positional drainage. Assure that mucus does not obstruct the airway. Do not give anything by mouth to an unconscious person.
Inhalation:	Remove to fresh air and ventilate the contaminated area. Give oxygen or artificial respiration if needed.

SECTION V – FIRE FIGHTING MEASURES

Fire and explosion hazard:	The battery can leak and/or spout vaporized or decomposed and combustible electrolyte fumes in case of exposure above 70°C resulting from inappropriate use or the environment.
Extinguishing media:	Fires involving Li-ion batteries can be controlled with water. When water is used, however, possible formation of hydrogen fluoride (HF) and phosphorous oxides during fire. LiPF_6 salt contained in the electrolyte releases hydrogen fluoride (HF) in contact with water In this situation, dry chemical or foam extinguishers are recommended to extinguish the fire.

Special exposure hazards:	<p>Following cell overheating due to external source or due to improper use, electrolyte leakage or battery container rupture may occur and release inner component/material in the environment.</p> <p>Eye contact: The electrolyte solution contained in the battery is irritant to ocular tissues.</p> <p>Skin contact: The electrolyte solution contained in the battery causes skin irritation.</p> <p>Ingestion: The ingestion of electrolyte solution causes tissue damage to throat and gastro/respiratory tract.</p> <p>Inhalation: Contents of a leaking or ruptured battery can cause respiratory tract, mucus, membrane irritation and edema.</p>
Special protective equipment:	<p>Use self-contained breathing apparatus to avoid breathing irritant fumes.</p> <p>Wear protective clothing and equipment to prevent body contact with electrolyte solution.</p>

SECTION VI – ACCIDENTAL RELEASE MEASURES

The material contained within the batteries would only be expelled under abusive conditions.

Personal precautions, protective equipment and emergency procedures:	Restrict access to area until completion of clean-up. Do not touch the spilled material. Wear adequate personal protective equipment as indicated in section VIII.
Environmental precautions:	Prevent material from contaminating soil and from entering sewers or waterways.
Methods and materials for containment:	Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up spills immediately.
Methods and materials for cleaning up:	<p>Cover battery or spilled liquid with dry sand or vermiculite, place in approved container (after cooling if necessary) and dispose in accordance with local regulations.</p> <p>Scrub the area with detergent and water; collect all contaminated wash water for proper disposal.</p>

SECTION VII – HANDLING AND STORAGE

When packing the batteries, do not allow battery terminals to contact each other, or contact with other metals.

- Be sure to pack batteries by providing partitions in the packaging box, or in a separate plastic bag so that the single batteries are not mixed together.(1)(2)
- Use strong material for packaging boxes so that they will not be damaged by vibration , impact, dropping and stacking during their transportation.(1)(2)(3)
- Do not let water penetrate into packaging boxes during their storage and transportation.
- The batteries will be stored at room temperature, charged to about 30-50% of capacity.

- Do not store the battery in places of the high temperature exceeding 35deg.C or under direct sunlight or in front of a stove. Please also avoid the places of high humidity. Be sure not to expose the battery to condensation, water drop or not to store it under frozen condition.
- Batteries are sure to be packed in such a way as to prevent short circuits under conditions normally encountered in transport.(1)(2)(3)
- Please avoid storing the battery in the places where it is exposed to the static electricity so that no damage will not be caused to the protection circuit of the battery pack.

The batteries should not be opened, destroyed nor incinerated since they may leak or rupture and release in the environment the ingredients they contain.

Handling	Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non conductive (i.e. plastic) trays.
Storage	Store in a cool (preferably below 30°C) and ventilated area away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 70°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not jumble them.
Other	Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range.

Applying pressure on deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory protection	Not necessary under normal use. In case of battery rupture, use self contained full-face respiratory equipment.
Hand protection	Not necessary under normal use. Use gloves if handling a leaking or ruptured battery.
Eye protection	Not necessary under normal use. Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery.
Skin protection	Not necessary under normal use Use rubber protective working in case of handling of a ruptured battery.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance (Physical shape and color as supplied:)

Small prismatic metal cylinders, hermetically sealed and fitted with an external plastic sleeve.

9.2 Temperature range:

	Continuous	Occasional
In storage	+30°C max	-40 ~ +70°C
During discharge	-30 ~ +70°C	-40 ~ +70°C
During charge	0 ~ +50°C	0 ~ +50°C

9.3. Specific energy: about 160 Wh/kg

(Note : Wh = Nominal voltage x Rated Ah as defined in IEC Standard 60285. Kg = Average battery weight)

9.4 Specific pulse power: about 260 Wh/kg**SECTION X – STABILITY AND REACTIVITY**

Conditions to avoid	Heat above 70°C or incinerate. Deform, mutilate, crush, pierce, disassemble. Short circuit. Prolonged exposure to humid conditions.
Materials to avoid:	N/A
Hazardous decomposition products:	Corrosive/Irritant Hydrogen fluoride (HF) is produced in case of reaction of lithium hexafluorophosphate (LiPF ₆) with water. Combustible vapors and formation of Hydrogen fluoride (HF) and phosphorous oxides during fire.

SECTION XI – TOXICOLOGICAL INFORMATION

FULLWAT Lithium-Ion batteries do not contain toxic materials.

SECTION XII – ECOLOGICAL INFORMATION

When properly used or disposed, the Lithium-Ion batteries do not present environmental hazard.

SECTION XIII – DISPOSAL CONSIDERATIONS

In the European Union, manufacturing, handling and disposal of batteries is regulated on the basis of the Directive 2006/66/EC of the European parliament and of the council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC. Nickel metal hydride cells must be recycled. Importers and users inside EU find detailed information on disposal in their specific countries using the web site of the European Portable Batteries Association (http://www.epbaeurope.net/legislation_national.html).

Importers and users outside EU should consider the local law and rules, which vary from country to country. (In most countries, the trashing of used batteries is forbidden and the end-users are invited to dispose them properly, eventually through not-for-profit profit organizations, mandated by local governments or organized on a voluntary basis by professionals).

Lithium-Ion batteries should have their terminals insulated and be preferably wrapped in plastic bags prior to disposal.

SECTION XIV – TRANSPORTATION INFORMATION

Based on IATA dangerous goods regulation 56th Effective 1st January 2015, packing instruction 965 Section IB, the consignment is fully described by proper shipping name and packed, marked and in proper condition for carriage by air. According to the current edition of the IATA 56th Effective 1st January 2015, Dangerous goods regulations and all applicable carrier and government regulations and the battery can be shipped by air.

We also acknowledge that we may be liable for damage resulting from any blunder or omission and we further agree that any air carrier involved in the carriage of this consignment may rely upon this certification.

1. Cells and batteries are packed in inner packages that completely enclose the cell or battery (retail type plastic blister packs meet this requirement);
2. Cells and batteries are protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit;
3. Each package are capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
4. Quantity per package shall not exceed 10kg.
5. Each consignment are accompanied with a document such as an air waybill with an indication that:
 - the package contains lithium ion cells or batteries;
 - the package are handled with care and that a flammability hazard exists if the package is damaged;
 - special procedures are followed in the event the package is damaged, to include inspection and repacking if necessary; and
 - a telephone number for additional information.
6. Each package is labelled with a lithium battery handling label (Figure 7.4.H) in addition to the class 9 hazard label (Figure 7.3.V).
7. Each package are marked in accordance with the requirements of 7.1.5.1(a) and (b) and in addition the gross weight as required by 7.1.5.1(c) are marked on the package.

Recommendations on the transport of dangerous goods-Model Regulations 15th revised edition, IATA Special Provision A154, A164 and IMDG Special Provision 188.

SECTION XV – UN CLASS

Even classified as lithium ion batteries (UN3480), 2015 IATA Dangerous Goods Regulations 56th edition Packing Instruction 965 Section IB is applied. The product is handled as Non-Dangerous Goods by meeting the following requirements (1)

Lithium ion cells and batteries offered for transport are not subject to other additional requirements of the UN Regulations if they meet the following (1)(3)

1. for cells, the Watt-hour rating is not more than 20WH
2. for batteries, Watt-hour rating is not more than 100WH

The Watt-hour rating must be marked on outside of the battery case except those manufactured before 1st January 2013 which may be transported without this marking until 31st December 2013.

3. each cell or battery is of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria Part III subsection 38.3.

Regulatory Information

IATA Dangerous Goods Regulations 56th Edition Effective 1st January 2015.

ICAO Technical Instructions for the safe transport of dangerous goods by air.

SECTION XVI – REFERENCE

- (1) UN Recommendation on the Transportation of Dangerous Goods Model Regulations. (ST/SG/AC.10/1/Rev.15)
- (2) Federal Register/Vol.65.NO.174/Thursday, September 7th, 2000/Notices.
- (3) IATA Dangerous Goods Regulations 56th Edition Effective 1st January 2015.

SECTION XVII – OTHER INFORMATION/DISCLAIMER

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable. However, no representation, warranty (either or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein.

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10th December 2015