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IDX Company, Ltd.

# Information on the Safety of Lithium Ion Batteries

We have recently been made aware of a very serious field incident in Japan involving Lithium Ion (Li-ion) batteries supplied by another manufacturer. When the batteries were placed on charge, they caught fire which resulted in both the battery and charger melting.

***The incident took place in a camera store room in Japan and did not involve any IDX Li-ion batteries or IDX charger units. The only reason a major fire was prevented from spreading was due to the bravery of a cameraman who managed to move the units to an outdoor location!***

Following this incident, IDX Company, Ltd. would like to take this opportunity to inform customers who use IDX batteries and chargers of our general safety, technical and manufacturing methods. All IDX batteries and chargers are designed, tested and manufactured under very strict quality control and safety procedures, right down to each individual component that makes up the finished product. While IDX have not been involved with the investigation into the field incident mentioned above, this report has been made to ease any worries or anxieties regarding the everyday use of IDX Li-ion battery and charger products.

The information contained within this report is based on our knowledge and experience of IDX's manufacturing practices and procedures. IDX acknowledge that the manufacturing techniques of each Li-ion battery and charger manufacturer may vary.

## 1.0: Key factors that affect the safety of Li-ion batteries

**1.1** Li-ion batteries can contain multiple Li-ion battery cells, combined and assembled into a battery pack. If the capacity and voltage of each Li-ion battery cell inside the battery pack becomes unbalanced, unnecessary voltage can be added while the battery is charging. Although an IDX charger unit will only ever supply a maximum 16.8V charge into an attached battery pack, it is still possible for any unbalanced cells to receive additional charge.

**1.2** Li-ion battery cells can become unbalanced due to inferior build quality and poor insulation between the Li-ion cells, Printed Circuit Board (PCB) and exterior casing. Poor insulation can accelerate a slight current leakage from the PCB and each connection terminal. High quality insulation is essential to maintaining cell balance.

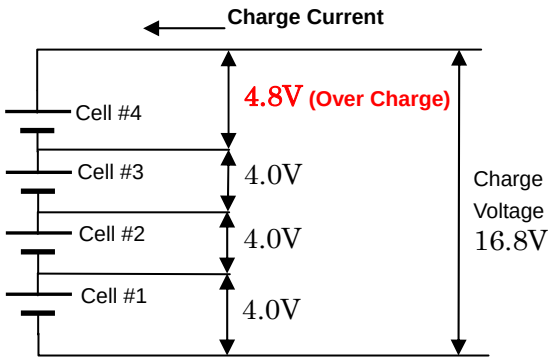
Although full technical details of the battery fire incident have not been disclosed to IDX, we can offer an explanation as to how this incident occurred based on our knowledge of how Li-ion cells work.

As highlighted in section **1.1**, if the charger unit continues to add charge voltage and current to the battery, the Li-ion battery cells can become extremely hot and pressurised within a short space of time. This can cause the battery cells to ignite and even explode. This could have been caused by the failure of the battery over charge protection circuit not recognising the battery has been fully charged. The battery pack should have been designed and assembled with internal safety and control measures to avoid this kind of incident.

It should be noted that all IDX manufactured Li-ion batteries have numerous safety protection circuits to make sure incidents such as this never occur. Please see section **2.0** for further details.

The diagram below outlines the general method of protection circuitry and cell assembly inside an IDX battery pack. Please be aware that the actual content and cell assembly of each IDX Li-ion battery model may be different. This diagram is to enable a general understanding only.

**Fig.1**



## 2.0: Safety protection method of IDX Li-ion batteries and charger

IDX Company, Ltd. design and implement a variety of safety and protection circuit features into each and every IDX Li-ion battery. In summary, these are as follows;

### 2.1 IDX work under very strict control and assembly procedures at the factory to minimise any chance of unbalanced cells.

2.1.1 IDX measures the voltage of every single Li-ion battery cell ***before*** assembly, to avoid the risk of placing unbalanced cells into the battery case.

2.1.2 IDX chooses Li-ion cells for each single battery from the same manufactured batch. More importantly only cells that have passed the IDX quality standard are chosen.

2.1.3 IDX design each Li-ion battery with prior authorisation from Li-ion battery cell manufacturer. Our factory has also been approved and authorised for battery assembly by the Li-ion cell manufacturer.

2.1.4 IDX Li-ion batteries are tested and approved under strict conformity and examination from the UN Manual of Tests & Criteria, Part III, sub-section 38.3.

### 2.2 IDX's safety protection circuit design means the over charge protection method is not just a 'one step' but a 'three step' process.

2.2.1 **Step 1** - Each individual cell within a cell group is constantly monitored. When each cell group reaches their specified voltage (as shown in Fig.1), the charge is stopped immediately.

2.2.2 **Step 2** - Each battery contains a Thermal Protector called a PolySwitch, which monitors the temperature of the battery cells. In the event of a battery's charge voltage monitoring device failing, the PolySwitch will detect any high temperatures above their specified limit and reduce the charge voltage to a safe level.

2.2.3 **Step 3** - Each battery has a Temperature Activation Thermal Fuse, which will terminate the charge voltage in the rare event that that the protection methods in Steps 1 & 2 fail.

In summary, IDX employ three safety protection methods to avoid any chance of the battery over charging and heating to a dangerous level.

### 2.3 The protection method of IDX chargers

All IDX chargers use very similar safety protection methods as IDX Li-ion batteries. The charger will monitor and detect several different measurements (charge voltage and charge current for example) between the charger and battery while charging. However the monitoring and detection features ***can only be guaranteed to work with batteries manufactured by IDX.***

## 3.0: Advisory action in case of emergency with non-IDX batteries

The monitoring and protective features on an IDX charger will only activate should the protective circuit on an IDX battery ever fail. If other battery brands are used on an IDX charger, the charger's protection features may not be able to stop batteries from overcharging, overheating, and in a worst case scenario, the battery igniting into flames. Should this scenario ever occur, IDX recommend taking the followings steps as a safety precaution.

### 3.1 If the battery pack on the charger unit becomes abnormally hot or emits a light smoke/fume.

1. Turn off the charger mains switch and disconnect the AC power cable.
2. Move the charger unit with the batteries to an outdoor location. Do not attempt to remove the batteries from the charger unit by hand as the temperature of the battery may cause injury.
3. Use a suitable fire extinguisher to avoid further fire damage.

### 3.2 If the battery pack on the charger unit emits smoke/fume and ignites.

1. Disconnect the AC power cable immediately.
2. Do not touch the batteries or charger unit by hand to avoid injury.
3. Immediately remove any flammable items from the surrounding area.
4. Retreat to a safe distance from both the battery and charger. Please use a fire extinguisher to put out any flames to stop it spreading to surrounding areas.
5. As a final precautionary measure against inferior batteries igniting while on a charger, it may be wise to keep a metal bucket filled with sand close by. In a worst case scenario, the affected batteries and charger should be placed inside the bucket and covered with a lid to avoid any fire or smoke spreading to the surrounding area. If this does happen, please take care to avoid any personal injury or damage.

## 4.0: Re-assembly or re-celling of Li-ion batteries

There are suppliers on the market that offer a battery 're-celling' service for Li-ion battery packs. IDX strongly recommend against this type of service. It is impossible for IDX batteries to be 're-celled' as each battery is hermitically sealed to secure the safety, function and reliability of the Li-ion cells and PCB control. When IDX batteries are assembled at our factory, they undergo strict testing and examination from the UN Manual of Tests & Criteria, Part III, sub-section 38.3.

## 5.0: Conclusion

To guard against the reported incident in Japan ***we strongly advise that only IDX batteries are used with IDX chargers.***