



2021 Guidance Document – Battery Powered Cargo Tracking Devices / Data Loggers

Revised for the 2021 Regulations – Revision 1

Introduction

Many shipments of time and temperature sensitive products including food, pharmaceutical, medical devices, vaccines, and industrial chemicals such as chemical-mechanical planarization (CMP) slurries, adhesives, and sealants contain, or have attached to the package(s) and/or overpack(s) small battery-powered tracking devices / data loggers. Most of these devices use lithium metal or lithium ion cells or batteries as a power source.

Lithium cells and batteries are classified as dangerous goods and therefore must meet all the applicable provisions of the IATA Dangerous Goods Regulations (DGR) when shipped by air. This applies regardless of whether the lithium cells or batteries are shipped as cargo by themselves or whether the lithium cells or batteries are installed in a small device such as a data logger that is placed inside or attached to packages of cargo. In addition, to be permitted in transport all lithium cell and battery types must have passed the applicable tests set out in Subsection 38.3 of the UN Manual of Tests and Criteria.

The purpose of this document is to provide guidance on:

1. complying with provisions applicable to the transport by air of lithium batteries as set out in the DGR when lithium battery powered data loggers are contained in cargo; and
2. recommendations with respect to the use of battery-powered devices that are active during transport.

Specifically, the document provides information on:

Definitions

Requirements for lithium cells and batteries

Recommendations on shipping active devices

Frequently Asked Questions

Additional Information

This document is based on the provisions set out in the 2021-2022 Edition of the ICAO *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Technical Instructions) and the 62nd Edition of the IATA DGR, Section II of Packing Instructions (PI) 967 and PI 970.

The provisions of the DGR with respect to lithium batteries may also be found in the IATA Lithium Battery Shipping Guidelines (LBSG). In addition to the content from the DGR, the LBSG also has additional classification flowcharts and detailed packing and documentation examples for lithium batteries.

The recommendations for active devices are taken from advisory information produced by the European Aviation Safety Authority (EASA), [AMC1 CAT.GEN.MPA.140](#) – Portable Electronic Devices and the US Federal Aviation Administration (FAA) Advisory Circular [AC 21.91-1D](#) – Use of Portable Electronic Devices Aboard Aircraft. Much of the information in this guidance document related to the conditions that apply to data loggers and cargo tracking devices in or attached to cargo carried in aircraft cargo compartments is taken from Section 10 of FAA Advisory Circular AC 21.91-1D.

Information on the DGR and LBSG can be found here:

<http://www.iata.org/dgr>

<http://www.iata.org/lbsg>

Definitions

Lithium Battery – The term “lithium battery” refers to a family of batteries with different chemistries, comprising many types of cathodes and electrolytes. For the purposes of the DGR they are separated into:

Lithium metal batteries. Are generally primary (non-rechargeable) batteries that have lithium metal or lithium compounds as an anode. Also included within lithium metal are lithium alloy batteries. Lithium metal batteries are generally used to power devices such as watches, calculators, cameras, temperature data loggers, car key fobs and defibrillators.

△ **Note:**

Lithium metal batteries packed by themselves (not contained in or packed with equipment) (Packing Instruction 968) are forbidden for transport as cargo on passenger aircraft). In accordance with Special Provision A201, lithium metal cells or batteries that meet the quantity limits of Section II of PI 968 may be shipped on a passenger aircraft under an approval issued by the authority of the State of Origin, State of Destination and State of the Operator. Or in the case of urgent medical need, one consignment of lithium batteries may be transported as Class 9 (UN 3090) on passenger aircraft with the prior approval of the authority of the State of origin and with the approval of the operator, see Special Provision A201. All other lithium metal cells and batteries can only be shipped on a passenger aircraft under exemption issued by all States concerned.



Figure 1 - Example of Lithium Metal Cells and Batteries

Lithium-ion batteries (sometimes abbreviated Li-ion batteries) are a secondary (rechargeable) battery where the lithium is only present in an ionic form in the electrolyte. Also included within the category of lithium-ion batteries are lithium polymer batteries. Lithium-ion batteries are generally used to power devices such as mobile telephones, laptop computers, tablets, power tools and e-bikes.



Figure 2 - Example of Lithium Ion Cells and Batteries

△ **Note:**

Lithium ion batteries packed by themselves (Packing Instruction 965) (not contained in or packed with equipment):

- (a) must be shipped at a state of charge (SoC) not exceeding 30% of their rated design capacity. Cells and/or batteries at a SoC of greater than 30% 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, see Special Provision A331; and*
- (b) may be shipped as cargo on a passenger aircraft under an approval issued by the authority of the State of Origin, State of Destination and State of the Operator where the lithium ion cells or batteries that meet the quantity limits of Section II of PI 965. Or in the case of urgent medical need, one consignment of lithium batteries may be transported as Class 9 (UN 3480) on passenger aircraft with the prior approval of the authority of the State of origin and with the approval of the operator, see Special Provision A201. All other lithium ion cells and batteries can only be shipped as cargo on a passenger aircraft under exemption issued by all States concerned.*

Aggregate lithium content means the sum of the grams of lithium content contained by the cells comprising a battery.

The technical definition of a battery and cell, as indicated in the UN *Manual of Tests and Criteria*, is as follows:

Battery means two or more cells which are electrically connected together and fitted with devices necessary for use, for example, case, terminals, marking and protective devices. Units which have two or more cells that are commonly referred to as "battery packs", "modules" or "battery assemblies" having the primary function of providing a source of power to another piece of equipment are for the purposes of the UN Model Regulations and this guidance document treated as batteries. See definitions for "cell" and "single cell battery". (See also "Power Banks")

Button cell or battery means a round small cell or battery when the overall height is less than the diameter.

Cell means a single encased electrochemical unit (one positive and one negative electrode) which exhibits a voltage differential across its two terminals. Under the UN Model Regulations, UN *Manual of Tests and Criteria* and this guidance, to the extent the encased electrochemical unit meets the definition of "cell" herein, it is a "cell", not a "battery", regardless of whether the unit is termed a "battery" or a "single cell battery" outside of the UN Model Regulations, the UN *Manual of Tests and Criteria* and this guidance.

Consignment, one or more packages of dangerous goods accepted by an operator (airline) from one shipper at one time and at one address, receipted for in one lot and moving to one consignee at one destination address.

Operator, a person, organisation or enterprise engaged in or offering to engage in an aircraft operation.

Overpack, an enclosure used by a single shipper to contain one or more packages and to form one handling unit for convenience of handling and stowage. Dangerous goods packages contained in the overpack must be properly packed, marked, labelled and in proper condition as required by the DGR. (A Unit Load Device is not included in this definition).

Package, (for dangerous goods) the complete product of the packing operation consisting of the packaging and contents prepared for transport.

Packaging, one or more receptacles and any other components or materials necessary for the receptacles to perform their containment and other safety functions and to ensure compliance with the minimum packing requirements of the DGR.

Unit Load Device (ULD), any type of freight container, aircraft container, aircraft pallet with a net, or aircraft pallet with a net over an igloo.

Note:

An overpack is not included in this definition.

Watt-hour Rating, expressed in Watt-hours (Wh), the Watt-hour rating of a lithium cell or battery is calculated by multiplying the rated capacity in ampere-hours by the nominal voltage.

Classification (DGR 3.9.2.6)

Lithium batteries are classified in Class 9 – Miscellaneous dangerous goods as:

- UN 3090, **Lithium metal batteries**; or
- UN 3480, **Lithium ion batteries**

or, if inside a piece of equipment or packed separately with a piece of equipment to power that equipment as:

- UN 3091, **Lithium metal batteries contained in equipment**; or
- UN 3091, **Lithium metal batteries packed with equipment**; and
- UN 3481, **Lithium ion batteries contained in equipment**; or
- UN 3481, **Lithium ion batteries packed with equipment**.

Lithium battery test summary, manufacturers and subsequent distributors of cells or batteries and equipment powered by cells and batteries manufactured after 30 June 2003 must make available the test summary as specified in the UN *Manual of Tests and Criteria*, Revision 6 and amend. 1, Part III, sub-section 38.3, paragraph 38.3.5.

Note:

The requirement is for the manufacturer and subsequent distributors to make this test summary available. There are numerous ways this can be achieved, such as by listing the applicable summary document on the company website. There is no expectation for the shipper/distributor to provide paper copies with each consignment containing lithium batteries. The supply chain are encouraged to make use of technology to facilitate the availability of the test summary.

The following table provides details of the information required in the test summary:

Lithium cell or battery test summary in accordance with sub-section 38.3 of Manual of Tests and Criteria
<p>The following information shall be provided in this test summary:</p> <ul style="list-style-type: none"> (a) Name of cell, battery, or product manufacturer, as applicable; (b) Cell, battery, or product manufacturer's contact information to include address, phone number, email address and website for more information; (c) Name of the test laboratory to include address, phone number, email address and website for more information; (d) A unique test report identification number; (e) Date of test report; (f) Description of cell or battery to include at a minimum: <ul style="list-style-type: none"> (i) Lithium ion or lithium metal cell or battery; (ii) Mass; (iii) Watt-hour rating, or lithium content; (iv) Physical description of the cell/battery; and (v) Model numbers. (g) List of tests conducted and results (i.e., pass/fail); (h) Reference to assembled battery testing requirements, if applicable (i.e. 38.3.3 (f) and 38.3.3 (g)); (i) Reference to the revised edition of the Manual of Tests and Criteria used and to amendments thereto, if any; and (j) Signature with name and title of signatory as an indication of the validity of information provided.

Further information on the test summary and FAQ's is available in [Part 4](#) of this guidance document.

Requirements for Lithium Cells and Batteries

The extent to which the lithium cells or batteries are regulated as dangerous goods depends on:

- (a) the lithium metal content for lithium metal cells or batteries; or
- (b) the Watt-hour (Wh) rating for lithium ion cells or batteries.

Fully Regulated Lithium Batteries

Lithium metal cells with a lithium metal content exceeding 1 g and lithium metal batteries with a lithium metal content exceeding 2 g.

Lithium ion cells with a Watt-hour rating exceeding 20 Wh and lithium ion batteries with a Watt-hour rating exceeding 100 Wh.

Devices that contain fully regulated lithium cells or batteries are subject to all of the provisions of the DGR, which includes:

- (a) dangerous goods training. All persons involved in the preparation and shipping must have completed appropriate dangerous goods training and must attend recurrent dangerous goods training at intervals not exceeding 24 months;

- (b) marks and labels on packages. All packages must be marked with the name and address of the shipper and consignee, the UN number and proper shipping name. Packages must also bear the Class 9 lithium battery hazard label;
- (c) documentation. The consignment must be correctly described on a Shipper's Declaration for Dangerous Goods.

Excepted Lithium Batteries

Where the lithium cells or batteries have a lithium metal content of 1 g or less for cells or 2 g or less for batteries or for lithium ion the cells have a Watt-hour rating of 20 Wh or less or batteries are 100 Wh or less, then they are not subject to all of the provisions of the DGR.

Lithium cells or batteries that fit within these limits are subject to Section II of the applicable lithium battery packing instructions in the DGR. Each package that contains such cells or batteries, including those installed in devices, must not contain more than 5 kg net weight of lithium cells or batteries.

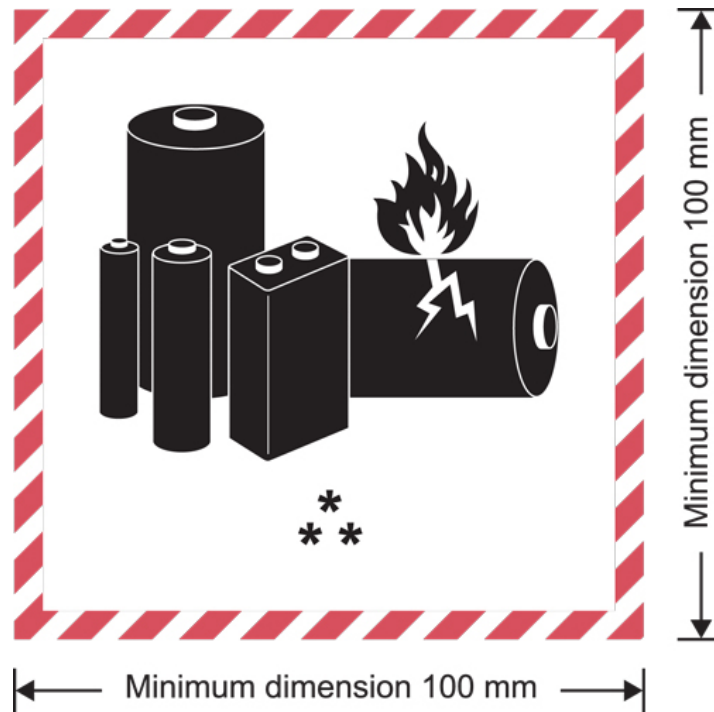
△ Cargo Tracking Devices / Data Loggers Containing Excepted Lithium cells or Batteries

Packages containing lithium batteries installed in equipment such as a data logger must bear the lithium battery mark as shown in Figure 7.1.C of the IATA DGR, see Figure 3. The border of the label must have red diagonal hatchings 5 mm in width with text and symbols in black on a white or contrasting background. The lithium battery mark may be printed directly on the outer packaging provided that there is sufficient contrast between the elements of the lithium battery mark and the colour of the packaging material. The mark must be in the form of a rectangle or a square with minimum dimensions are 100 mm x 100mm.

Exceptions:

1. *the lithium battery mark is not required on packages where the data loggers are powered by only button (coin) cells (regardless of the quantity of data loggers in a particular package or the number of packages in a consignment);*
 2. *the lithium battery mark is not required on packages where there are no more than 4 cells or 2 batteries contained in equipment in each package and there are no more than two packages in the consignment;*
 3. *packages containing COVID-19 vaccines accompanied by data loggers and/or cargo tracking devices containing lithium batteries are not subject to the marking and documentation requirements of Section II of Packing Instruction 967 or 970, as applicable.*
- △ This means that unless the package(s) contain COVID-19 vaccines, where the cargo tracking device or data logger is powered by other than lithium button (coin) cells and there are more than two packages containing tracking devices/data loggers, then the lithium battery mark must be applied to all packages in the consignment that contain tracking devices/data loggers.

Figure 3 – Lithium Battery Mark



* Place for UN number(s), i.e. UN 3090, UN 3091, UN 3480 and/or UN 3481, as applicable

** Place for telephone number

Where the packages are of dimensions such that they cannot bear the full-size lithium battery mark, the mark dimensions may be reduced to 100 mm wide × 70 mm high. The design specifications otherwise remain the same.

The telephone number on the lithium battery mark should be that of a person knowledgeable about the shipment but is not intended to be for the purposes of obtaining immediate emergency response guidance, and is therefore not required to be monitored at all times while the package is in transit. It is acceptable for the number to be monitored during the company's normal business hours in order to provide product-specific information relative to the shipment. However, it also is acceptable to use an emergency response, 24-hour phone number on the lithium battery mark.

Where a consignment includes packages bearing the lithium battery mark, the words "Lithium ion batteries in compliance with Section II of PI 967" or "Lithium metal batteries in compliance with Section II of PI 970", as applicable must be included on the air waybill, when an air waybill is used. The information should be shown in the "Nature and Quantity of Goods" box of the air waybill.

Note:

A Shipper's Declaration for Dangerous Goods is not required.

Shippers of excepted lithium batteries are not subject to the formal dangerous goods training requirements set out in DGR 1.5, however, persons preparing such shipments must be provided with "adequate instruction" as described in DGR 1.6.

The following is offered as a starting point for an employer on what could be considered as being adequate instruction:

1. The employer must identify the different configurations of lithium batteries that they ship, i.e. lithium batteries and/or lithium batteries packed with equipment and/or lithium batteries contained in equipment; lithium metal batteries and/or lithium ion batteries.
2. The employer must document the procedures that apply to the configurations and battery types that they ship as determined in 1, above.
3. The procedures should be written up as a clear work instructions or other form of information that is available to all employees responsible for the preparation of lithium battery shipments.
4. All employees that are involved in the process of preparing lithium battery shipments must be taken through the procedure to ensure that they understand and can demonstrate the correct application of documented procedures for the packing, labelling, marking and documentations requirements, as applicable to their job function.
5. A record must be maintained that identifies each applicable employee and the date(s) that this instruction was provided.
6. Employees should be given periodic refresher, or at least demonstrate that they remain “adequately” instructed on how to perform the task. This should be done at least every two years or whenever the procedure is revised, or regulations are changed, whichever is sooner.
7. Companies that are involved in reverse logistics, i.e. arranging for returns of lithium batteries, lithium batteries packed with equipment or lithium batteries contained in equipment must develop a clear instruction for consumers on the process to be followed for returning products. This instruction must include packaging materials and lithium battery marks, as necessary. The instruction must also include the transport method and mode of transport to be followed; this must include a clear statement on applicable prohibitions.

Recommendations on Shipping Active Devices (Extract from FAA AC 91.21-1D)

Portable electronic devices (PED) such as data loggers and cargo tracking devices, that are designed to remain active throughout their entire transport from the shipper to the consignee, including when on board an aircraft, have the potential to interfere with aircraft navigation or communication systems.

Therefore, manufacturers of PED, users of PED and the operator (airline) are only permitted to place in or attach to cargo and to carry PED that the operator of the aircraft has determined will not interfere with the safe operation of that aircraft. The recommendations set out in this document are one means, but not the only means, of complying with the applicable operational regulations pertaining to the operation of PED.

This section applies to PED that are designed for use on aircraft in locations inaccessible to the flight crew during flight. Because this class of PED cannot be turned off manually in the event of an emergency, the device manufacturers and aircraft operators must ensure certain design and operational considerations are addressed. The operator must ensure that these PED meet the following criteria prior to allowing use on aircraft:

1. during all modes of operation, the cargo tracking device / data logger meets the RF radiated emissions limits defined in RTCA DO-160, Environmental Conditions and Test Procedures for Airborne Equipment, Section 21, Category H. Testing of the device must include any peripheral devices that will be used with the device during normal operations. Typically, peripherals include external sensors or associated wiring. For additional Guidance, refer to RTCA/DO-357, User Guide: Supplement to DO-160G.

2. if the test described in subparagraph 1. fails or is not met, then the device must be designed with a minimum of two independent means to turn off completely, turn off cellular or mobile functions, or a combination of both when airborne. These independent methods must use different sources to identify flight. For example, a cargo tracking device designed to sense rapid altitude changes and acceleration to turn off cellular transmissions is an acceptable design feature that meets the requirement. Redundant sources of the same information, such as two vertical accelerometers, would not be an acceptable design.
3. The device may use low-powered wireless communications during flight without the need to comply with subparagraph 1. This includes Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4).
4. the device manufacturer substantiated data includes:
 - (a) pictures of the device and any peripherals,
 - (b) product label,
 - (c) operational description of device and peripherals,
 - (d) manufacturer statement of strict design and production controls, and
 - (e) if device contains a lithium battery, battery design standard and relevant battery qualification documentation (e.g., TSO-C142a, Non-Rechargeable Lithium Cells or Batteries, dated August 7, 2006, approval; RTCA/DO-311, Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems, dated March 13, 2008, qualification report, maintenance requirements and process and procedures to address the movement of defective devices, including damaged or defective batteries).
5. the device must not be capable of generating a dangerous evolution of heat.
6. the device must not be capable of emitting disturbing signals, such as buzzing alarms or strobe lights, during transport.

Manufacturers of cargo tracking devices/data loggers should undertake all of the required testing of their devices so that they can satisfy the aircraft operator that the devices comply with the recommendations above. It is recommended that the device manufacturers coordinate with the aircraft operators so that a list of approved devices is available to users of the devices.

It is the operator that retains the responsibility to approve the use and carriage of PED in cargo and it is the operator that will issue any authorisation or approval on the use of PED on their aircraft.

It is recommended that manufacturers of PED that are intended to be placed into, or attached to cargo make contact with operators in advance so that the approval / authorisation can be coordinated. This will avoid the need for multiple individual shippers to seek approval / authorisation for the same device.

Frequently Asked Questions

Part 1 – Questions Related to Definitions**A. What are the various types of lithium batteries?**

Lithium batteries fall into two broad classifications; lithium metal batteries and lithium ion batteries. Lithium metal batteries are generally non-rechargeable and contain metallic lithium. Lithium ion batteries contain lithium which is only present in an ionic form in the electrolyte and are rechargeable.

Within these two broad classifications there are many different chemistries. For example within lithium ion batteries there are lithium polymer, lithium iron phosphate (LiFePO₄), lithium air to name a few.

B. What is the difference between a lithium cell and a lithium battery?

A lithium cell is a single encased electrochemical unit consisting of one positive and one negative electrode that exhibits a voltage differential across the two terminals. A lithium battery is two or more cells electrically connected. A single cell battery is considered a cell and not a battery for the purposes of the limitations set out in the DGR.

***Note:** Units that are commonly referred to as “battery packs” or “power banks” having the primary function of providing a source of power to another piece of equipment are for the purposes of these Regulations treated as batteries. Refer to the section on Definitions for complete details.*

C. How are component cells connected to form a battery?

Cells in batteries may be connected in parallel, in series, or in a combination of the two. When cells are connected in series, the voltage of the battery increases but the capacity in ampere-hours (Ah) does not change. By contrast, when cells are connected in parallel the capacity in ampere-hours of the battery (Ah) increases but the voltage stays the same.

D. How do I determine the watt-hour rating for a particular lithium ion battery?

The watt-hour (Wh) rating is a measure by which lithium ion batteries are regulated. Section I Lithium ion batteries manufactured after 31 December 2011 and Section IB and Section II Lithium ion batteries manufactured after 1 January 2009 are required to be marked with the watt-hour rating.

You can also arrive at the number of watt-hours your battery provides if you know the battery's nominal voltage (V) and capacity in ampere-hours (Ah):

$$\text{Ah} \times \text{V} = \text{Wh}$$

Note:

If only the milliampere-hours (mAh) are marked on the battery then divide that number by 1000 to get ampere-hours (Ah) (i.e. 4400 mAh / 1000 = 4.4 Ah).

Most lithium ion batteries marketed to consumers are below 100 watt-hours. If you are unsure of the watt-hour rating of your lithium ion battery, contact the manufacturer.

E. What is a button cell battery?

A button cell battery is a round small cell where the overall height is less than the diameter. Button cells are often referred to as “coin” cells.

Part 2 – Questions Related to Design Type Testing Provisions

A. Where can I find requirements related to testing of battery design types?

The UN *Manual of Tests and Criteria* sets out specific tests that must be conducted on each lithium cell or battery design type. Each test is intended to either simulate a common transportation occurrence such as vibration or changes in altitude or to test the integrity of a cell or battery. You may obtain a copy of these testing requirements via the following website:

http://www.unece.org/trans/danger/publi/manual/manual_e.html.

B. What constitutes a design change requiring renewed design type testing?

The following provisions are taken from the 7th revised edition of the UN Manual of Tests and Criteria, paragraph 38.3.2.2.

A cell or battery that differs from a tested design by:

- (a) For primary cells and batteries, a change of more than 0.1 g or 20% by mass, whichever is greater, to the cathode, to the anode, or to the electrolyte;
- (b) For rechargeable cells and batteries, a change in Watt-hours of more than 20% or an increase in voltage of more than 20%; or
- (c) A change that would materially affect the test results.

shall be considered a new type and shall be subjected to the required tests.

Note: the type of change that might be considered to differ from a tested type, such that it might lead to a failure of any of the test results, may include, but is not limited to:

- (a) A change in the material of the anode, the cathode, the separator or the electrolyte;*
- (b) A change of protective devices, including the hardware and software;*
- (c) A change of safety design in cells or batteries, such as a venting valve;*
- (d) A change in the number of component cells;*
- (e) A change in connection mode of component cells;*
- (f) For batteries which are to be tested according to T.4 with a peak acceleration less than 150 g_n, a change in the mass which could adversely impact the result of the T.4 test and lead to a failure.*

In the event that a cell or battery type does not meet one or more of the test requirements, steps shall be taken to correct the deficiency or deficiencies that caused the failure before such a cell or battery type is retested.

C. Who is responsible for testing lithium cells and batteries?

It is the manufacturer of the lithium cell type to have the type tested against the applicable provisions set out in Subsection 38.3 of the UN Manual of Tests and Criteria. In addition where lithium cells are combined together to form a battery, the manufacturer of the lithium battery must have the battery type tested against the applicable provisions set out in Subsection 38.3 of the UN Manual of Tests and Criteria.

Manufacturers of devices that incorporate lithium cells or batteries are required to make available a copy of the test summary for the lithium cells or batteries, see Part 4 of this guidance for more detail.

Part 3 – Questions related to Packaging and Transport Provisions

A. If I have smaller packages, can I use a smaller lithium mark?

Where the packages are of dimensions such that they cannot bear the full-size lithium battery mark, the mark dimensions may be reduced to 105 mm wide × 74 mm high. The design specifications remain otherwise the same.

B. When is a lithium battery mark not required on the package?

A lithium battery mark is not **required** for packages prepared in accordance with Section II of PI 967 or PI 970 containing only button cell batteries installed in equipment (including circuit boards) or consignments of two packages or less where each package contains no more than four cells, or two batteries installed in equipment.

Note:

The Air Waybill is only required to contain the statements "Lithium [ion or metal] batteries in compliance with Section II of PI9XX" when the lithium battery mark is affixed to the package(s).

C. Section II in Packing Instructions 967 and 970 states that "the lithium battery mark is not required on consignments of two packages or less where each package contains no more than four cells or two batteries installed in equipment." What is the intent of this provision?

This provision is to require, where there are more than two packages in the consignment, that each package bears the lithium battery mark, and therefore the air waybill has the compliance statement e.g. "Lithium [ion or metal] batteries in compliance with Section II of PI 9xx [67 or 70]".

The provision continues to allow for small consignments of one or two packages containing no more than four cells or two batteries installed in equipment per package to move without the lithium battery mark and therefore without the compliance statement on the air waybill.

Note:

A consignment is one or more packages of dangerous goods accepted by an operator (airline) from one shipper at one time and at one address, receipted for in one lot and moving to one consignee at one destination address.

D. For the purposes of the lithium battery packing instructions, what is considered the "package"?

The package is the complete product of the packing operation that satisfies the requirements of the packing instruction and in a manner ready to be presented for transport (shipper/consignee information, hazard communication, net quantity of lithium batteries is within limits). The package may contain multiple batteries or pieces of equipment provided the limitations set out in the applicable packing instruction are not exceeded. The package must be marked and labelled as required by the packing instruction.

A "package" may contain multiple boxes that are all placed inside an outer packaging to form a discrete unit for transport provided that the total net quantity of lithium cells or batteries inside the "package" does not exceed 5 kg. Or, one or more packages may then be placed into an overpack for ease of handling or transport purposes. When an overpack is used, the package marks and labels must be duplicated on the overpack unless the marks and labels required on individual packages are visible, or are not required by the packing instruction (i.e. not more than 4 cells or 2 batteries when contained in equipment and no more than two packages in the consignment).

E. Can a single lithium battery mark be used to identify that both lithium metal and lithium ion batteries are contained inside the package?

Yes. The mark may bear all applicable UN numbers, e.g. UN 3091, UN 3481, to identify that the package contains lithium metal batteries packed with, or contained in equipment and lithium ion batteries packed with, or contained in equipment.

F. What are the requirements for the telephone number on the lithium battery mark?

The telephone number should be of a person knowledgeable about the shipment but is not intended to be for the purposes of obtaining immediate emergency response guidance, and is therefore not required to be monitored at all times that the package is in transit. It is acceptable for the number to be monitored during the company's normal business hours in order to provide product-specific information relative to the shipment. However, it also is acceptable to use an emergency response, 24-hour phone number on the lithium battery mark.

G. Is it acceptable to apply the lithium battery mark to packages that contain only button cells installed in equipment?

Yes, the allowance not to apply the lithium battery mark to packages containing equipment with only button cells is a relaxation from the regulations, not a prohibition. However, if the package(s) bear the lithium battery mark, then the compliance statement must be included on the air waybill, when an air waybill is used.

H. Does IATA require a MSDS or SDS containing the UN test data?

No. The IATA DGR does not require a safety data sheet (SDS) when offering lithium batteries for transport.

Notes:

1. *A SDS is not a transport document. A SDS is only required for the supply and use of a substance or mixture meeting the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) classification criteria. GHS does not include provisions for manufactured articles.*
2. *Manufacturers and subsequent distributors of lithium cells and batteries and equipment with installed lithium cells or batteries must make available a test summary that identifies that the cell and battery types have passed the applicable UN 38.3 tests, see Part 4 of this document.*

I. May lithium battery packages be placed in an overpack in accordance with the IATA Dangerous Goods Regulations?

Yes. The overpack may also contain packages of dangerous goods or goods not subject to the Regulations provided there are no packages enclosing different substances which might react dangerously with each other. An overpack must be marked with the word "overpack" and must be labelled with the lithium battery mark (DGR Figure 7.1.C), unless the mark(s) on the package(s) inside the overpack are visible or not required by the Packing Instruction.

In addition, the word "overpack" must be marked on overpacks containing packages transported in accordance with Section I of the applicable Packing Instructions (i.e. bearing the Class 9 lithium battery hazard label).

Note:

For Section II of PI 965 and PI 968 the shipper is limited to one (1) package per consignment (shipment) and no more than one (1) package complying with the requirements of Section II may be placed in an overpack. This overpack may also contain packages prepared in accordance with Section IA and/or IB of PI 965 and/or PI 968 and/or packages of other dangerous goods and/or packages of non-dangerous goods.

J. Do the quantity limits shown in the lithium battery packing instructions apply to overpacks containing lithium batteries?

The quantity limits shown in the packing instructions refer to the maximum net weight of lithium batteries in each package. Provided each package remains within the limit specified in the packing instruction, there are no limits specified for an overpack.

Note:

For Section II of PI 965 and PI 968 the shipper is limited to one (1) package per consignment (shipment) and no more than one (1) package complying with the requirements of Section II may be placed in an overpack. This package may be placed in an overpack. This overpack may also contain packages prepared in accordance with Section IA and/or IB of PI 965 and/or PI 968 and/or packages of other dangerous goods and/or packages of non-dangerous goods.

K. Can I ship recalled, damaged or non-conforming cells or batteries?

Lithium 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 by air (e.g. those being returned to the manufacturer for safety reasons). This applies also to lithium cells or batteries installed inside equipment such as mobile phones, laptops or tablets where the devices are subject to recall due to the safety concerns of the lithium cell or battery installed in the device.

Batteries which have some other defective feature (e.g. LEDs not showing charge, incorrect model number on label, or batteries not holding enough charge) could still be shipped by air. Also, laptops being returned may not have a defective battery, it may not meet the needs of the customer, may be defective itself (but not the battery), etc. In these situations air transport would be permitted. The battery or equipment manufacturer should be contacted to determine the appropriate shipping method.

L. How do I protect against "inadvertent activation"?

When batteries are contained in equipment, the equipment must be packaged in a manner that prevents unintentional activation or must have an independent means of preventing unintentional activation (e.g., packaging restricts access to activation switch, switch caps or locks, recessed switches, trigger locks, temperature sensitive circuit breakers, etc.). This requirement does not apply to devices which are intentionally active in transport (RFID transmitters, watches, sensors etc.) and which are not capable of generating a quantity of heat sufficient to be dangerous to packaging or personal safety.

M. I am shipping perishable and/or pharmaceutical cargo with lithium battery powered temperature or data loggers do I need to follow the Dangerous Goods Regulations?

Yes. All the applicable provisions for lithium batteries will need to be followed by the shipper of such devices, including the limitations for devices that are active during transport.

Note:

The Perishable Cargo Regulations (PCR) and/or Temperature Control Regulations (TCR) also apply to such shipments.

N. Does the definition of "consignment" apply to the house air waybill (HAWB) or to the master air waybill (MAWB)?

The use of HAWB or MAWB has no direct relationship to what is a "consignment". For example a MAWB may have multiple consignments where each of the consignments are from separate shippers, or are from one shipper but to separate consignees, or the MAWB may be just be a single consignment from one shipper to one consignee.

The following limitations apply to consignments:

1. a shipper is not permitted to consign more than one package of Section II, PI 965 or PI 968; and
2. a shipper is not permitted to consign more than two packages of lithium batteries contained in equipment under Section II of PI 967 and PI 970 where there are no more than 4 cells or 2 batteries in the package without the application of the lithium battery handling label (lithium battery mark) on the package.

The objective of these two conditions is to:

1. restrict the number of packages of just lithium batteries that are carried by air that are not subject to the dangerous goods acceptance check and that are not shown on the written information to the pilot-in-command. The intention here is to force shippers of multiple packages to declare these on a Shipper's Declaration for Dangerous Goods and therefore make the consignment subject to the full checks for air transport.
2. require appropriate hazard communication on packages and on the air waybill where a shipper has more than two packages of lithium batteries contained in equipment.

Notes:

1. *This does not mean that every retail "package" must bear the lithium battery mark. A shipper may place multiple retail boxes, each containing a lithium battery meeting Section II installed in equipment, into an outer packaging to form the package for air transport. There is no limit on the number of individual retail boxes that can be placed into the outer packaging, except that a "package" must not contain more than 5 kg net weight of lithium batteries. Each such package must bear the lithium battery mark and when an air waybill is used the air waybill must show the applicable compliance statement, e.g. "lithium ion batteries in compliance with section II of PI 967".*
2. *Shippers or freight forwarders should not try to split a consignment across multiple air waybills to try to avoid the application of the lithium battery mark where there are more than two packages with lithium batteries contained in equipment under Section II in a consignment.*

O. Are consignments that contain just Section II lithium batteries subject to a dangerous goods acceptance check by the airline or their ground handling agent?

No, the provisions in the lithium battery packing instructions for Section II do not include the dangerous goods acceptance check as one of the provisions that apply. Any decision on performing an acceptance check of packages that contain Section II lithium batteries is the airlines'. Dangerous goods acceptance are only legally required for fully regulated, Section I lithium batteries.

P. I am placing a data logger inside an aircraft unit load device (ULD) to monitor the temperature during transit. Do I need to place a lithium battery mark on the ULD?

No, If the data logger is not inside a package or overpack, the marking provisions of the DGR do not apply. It is only packages and overpacks that require marks and labels. Shippers must not attach marks and labels to ULD's.

Part 4 – Questions Related to the Lithium Battery Test Summary¹

A. Does the test summary apply to equipment containing lithium cells or batteries?

Yes, the test summary applies to all lithium cells and batteries, including button cells, irrespective of whether they are shipped alone or contained in equipment.

B. Can multiple batteries/manufacturers/products be listed on one report?

Yes, it is acceptable to have a single document that addresses multiple batteries / manufacturers / products, provided all required information is stated. For example, a tablet manufacturer may purchase lithium ion batteries from three different battery manufacturers. The test summary for the product will therefore list batteries and all related information (e.g. Watt-hours, test labs) from the three battery manufacturers without naming the manufacturer due to confidentiality issues.

C. Is it acceptable to list the various test houses, tests and range of revisions tested to for the UN 38.3 revision and amendments?

Yes, it is acceptable to have multiple test houses and their addresses, email information, etc. listed provided all required information is stated. The test house is not required to be aligned to a specific battery or product on the test summary when the test summary covers multiple batteries/products. It is required to have the test report number and date of test for each cell/battery/product listed on the test summary.

D. What is meant by physical description of cell or battery?

A physical description is intended to provide a check for the person requesting the test summary to know that it applies to the cell/battery/product covered by the test summary, i.e. if a cellular phone is the product being shipped, the invoice description or marketing name of the product as the physical description could be used on the test summary.

E. What does availability of report mean: “When requested?”

The test summary must be made available upon request. Any individual or entity in the supply chain may request the test summary, e.g. regulator, consumer, or transport provider.

F. Can the test summary provider require a requestor to obtain the document from a website?

Yes, it is acceptable for the provider to require the requestor to obtain a document electronically from a provider's website. The provider must ensure that the cell/battery/product has appropriate identifiers to align to the test summary.

G. If a manufacturer considers their suppliers, test house and battery data confidential and competitive information, how would test summary compliance be achieved?

All 10 data elements and listed subsets of information are required to be on the test summary. As indicated above, the test house information may be listed to cover a range of products.

H. If a test summary is requested by a dangerous goods enforcement agency, how quickly must the test summary be made available? For example, would a manufacturer be expected to immediately produce a test summary or provide it within a certain amount of time (e.g. 72 hours)

Due to the large volume of lithium batteries and lithium battery powered products that are shipped daily, manufacturers and distributors should not be expected to immediately provide a test summary for every product they ship. Manufacturers and distributors should be provided a reasonable amount of time to provide the required test summary.

I. Is there a mandated format for the test summary that manufacturers and distributors must follow?

No. Manufacturers and distributors may compile the information required in the test summary using any format. Below are 3 examples of a test summary:

Example 1 of a Lithium Ion Battery Test Summary

**LITHIUM CELLS OR BATTERIES TEST SUMMARY
IN ACCORDANCE WITH SUB-SECTION 38.3
OF UN MANUAL OF TESTS AND CRITERIA**

Revision Date: March 27, 2017 **Revision Number:** 001

Product Manufacturer: Beta Bell Phone Company
123 Beta Bell Lane
Bellweather, Arizona 99999

Telephone: 800-999-4545
Email: betabell@gmail.com
Web: www.betabell.com

Beta Bell’s product lithium ion cells and batteries have been successfully tested and comply with the UN Model Regulations, Manual of Test and Criteria, Part III, subsection 38.3.

PERFORMED TESTS		RESULTS	
38.3.4.1	T1	Altitude Simulation	Pass
38.3.4.2	T2	Thermal Test	Pass
38.3.4.3	T3	Vibration	Pass
38.3.4.4	T4	Shock	Pass
38.3.4.5	T5	External Short Circuit	Pass
38.3.4.6	T6	Impact / Crush	Pass
38.3.4.7	T7	Overcharge	Pass
38.3.4.8	T8	Forced Discharge	Pass

The UN38.3 tests were performed by one of the following test houses and were tested to UN Manual Test and Criteria Revision 3 Amendment 1 or subsequent revisions or amendments.

Test House A 123 Alpha Street Shanghai China E: testhousea@gmail.com T: 086-0310-04566 U: www.testhousea.com	Test House C 123 Chi Street Shanghai China E: testhouseC@gmail.com T: 086-0310-04588 U: www.testhousec.com
Test House B 123 Beta Street Shanghai China E: testhouseb@gmail.com T: 086-0310-04577 U: www.testhouseb.com	Test House D 123 Delta Street Shanghai China E: testhoused@gmail.com T: 086-0310-04599 U: www.testhoused.com

**LITHIUM CELLS OR BATTERIES TEST SUMMARY
IN ACCORDANCE WITH SUB-SECTION 38.3
OF UN MANUAL OF TESTS AND CRITERIA**

Product Test Information

Model numbers	Physical Description	Battery weight (kg) Mass	Wh rating	Test report number	Test report date
BB12389	Li ion polymer Cell phone Alpha A	0.035	6.25	RTS123, NMD456PO98 N4569-2 BN890A	03.02.2010 03.07.2010 03.10.2010 03.15.2010
BB12450	Li ion polymer Cell Phone Beta B	0.090	6.76	TYh765-KL-09 567-908HGT	08.09.2012 09.01.2012
BB67896	Li ion polymer Cell phone Chi C	0.026	5.25	89065RT-90 NHI-kl09	07.07.2010 07.04.2010
etc					
etc					
etc					
etc					
etc					
etc					

Signature _____
Name, Title

Example 2 of a Lithium Ion Battery Test Summary

UN38.3 Lithium Battery Test Summary for GreenTech Tablet Model No. T54321	
1	Battery Manufacturer <i>Confidential and Proprietary GreenTech Information</i>
2	Product Manufacturer GreenTech 123 Main Street Annapolis, MD 21012 888.111.2345 contact@greentech.com; www1.greentech.com
3	UN38.3 Test Lab Bob's Battery Test Lab 1600 Pennsylvania Avenue Smithfield, VA 12345 Phone: 211.789.2345 bob@testlab.org; www.testlab.org
4	Test Report Number Liion621345
5	Date of Test Report April 1, 2017
6	Description of Cell or Battery 7.4 V, 1800 mAh, 13.32 Wh Li ion battery, Model No. P1789 Small, rectangular plastic case, 100 grams
7	UN38.3 Tests Performed and Successfully Passed T.1, T.2, T.3, T.4, T.5, and T.7. (Note that T.6 and T.8 are not applicable to batteries.)
8	Assembled Battery Testing Requirements Not Applicable
9	Edition of UN Manual of Tests and Criteria Used Sixth Revised Edition
10	Name and Title of Signatory <i>Jason Alexander</i> Jason Alexander GreenTech Staff Engineer

Example 3 of a Lithium Metal Cell Test Summary

**LITHIUM CELLS OR BATTERIES TEST SUMMARY
IN ACCORDANCE WITH SUB-SECTION 38.3
OF MANUAL OF TESTS AND CRITERIA**

BATTERY TRANSPORTATION INFORMATION

Name of cell, battery or product manufacturer, as applicable: Item Number : 4A23123 Item Name : Battery Alpha Prime Item Description : Lithium Metal Battery (Primary)		Cell, battery or product manufacturer's contact information to include address, phone number, email address and website for more information: Manufacturer XYZ 3480 Lithium cells Rd Lithiumville, CA 98765 United States (+1-987) 987-6543 email@xyz.com	
Name of the test laboratory to include address, phone number, email address and website for more information: Test Lab A 1919 Alpha St Testcity, IA 55555 USA (+1-333) 555-1122 email@testlab.com		A unique test report identification number: ABC12345	Date of the test report: 03-Apr-2013
Description of cell or battery to include at a minimum: Lithium ion or Lithium metal cell or battery; Mass; Watt-hour rating, or lithium content; Physical description of the cell/battery; and Model numbers: Battery used in consumer power tools Cell/battery Type : Lithium metal Cell or Battery : Cell LC or W/h rating : LC (g): >0.3 <= 1 Cell or Battery Weight : 12.00 Grams		List of tests conducted and results (i.e., pass/fail): Test T.1: Altitude Simulation : Pass Test T.2: Thermal Test : Pass Test T.3: Vibration : Pass Test T.4: Shock : Pass Test T.5: External short circuit : Pass Test T.6: Impact/Crush : Pass Test T.7: Overcharge : Not applicable Test T.8: Forced discharge : Pass Testing additional comments:	
Reference to assembled battery testing requirements, if applicable (i.e., 38.3.3(f) and 38.3.3.(g)): Not applicable	Reference to the revised edition of the Manual of Tests and Criteria used and to amendments thereto, if any: Revision 5	For air transport only: Does the cell or battery comply with the 30% State of Charge? Not Applicable	
PRODUCT CLASSIFICATION FOR TRANSPORT (According to UN - DGP)			
UN Classification: UN 3090	Proper Shipping Name: Lithium metal batteries		
Signature with name and title of signatory as an indication of the validity of information provided: Wayne Purple Testing Manager	This document remains valid as long as no changes, modifications, or additions are made to the model(s) described in this document, after being transported from a Manufacturer XYZ facility. The model(s) has (have) been classified according to the applicable transport regulations and the UN Manual of Tests and Criteria as of the date of the certification. The model(s) must be packaged, labeled, and documented according to country and other international regulations for transportation.		
Date document was generated: 04-Mar-2017 11:49 am			

¹ Information in Part 4 kindly provided by PRBA – The Rechargeable Battery Association, RECHARGE the Advanced Rechargeable & Lithium Batteries Association and the Medical Device Battery Transport Council

Additional Information

Further information can be found here:

<http://www.iata.org/lithiumbatteries>

You may also contact the airline of your choice or your national civil aviation authority if you have any further concerns on the use or carriage of data loggers containing small batteries that are active (on) while in transport.

You can also contact the IATA Dangerous Goods Support team if you have questions or concerns which may not have been addressed in this document: dangood@iata.org

Abbreviations, Acronyms, Symbols

The following abbreviations, acronyms and symbols are used throughout the document.

Abbreviation	Meaning
A/C	Aircraft
Li Ion (li-ion)	Lithium ion
Li batt.	Lithium battery
PAX	Passenger
Acronym	Meaning
CAO	Cargo Aircraft Only
DGD	Shipper's Declaration for Dangerous Goods
DGR	IATA Dangerous Goods Regulations
LBSG	IATA Lithium Battery Shipping Guidelines
Symbol	Meaning
≥	Equal to or greater than
≤	Equal to or less than
>	Greater than
<	Less than
□	Addition of an item
△	Change to an item
⊗	Deletion of an item