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Lithium ion cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the Manual of Test and Criteria shall comply with the requirements of this special provision.

For the purposes of this special provision, these may include, but are not limited to:

- Cells or batteries identified as being defective for safety reasons;
- Cells or batteries that have leaked or vented;
- Cells or batteries that cannot be diagnosed prior to transport; or
- Cells or batteries that have sustained physical or mechanical damage.

Note: *In assessing a battery as damaged or defective, the type of battery and its previous use and misuse shall be taken into account.*

(1) Cells and batteries shall be transported according to the provisions applicable to UN No. 3090, UN No. 3091, UN No. 3480 and UN No. 3481, except Special Provision 230 and as otherwise stated in this special provision.

(2) Packages shall be marked „DAMAGED/DEFECTIVE LITHIUM ION BATTERIES“ or „DAMAGED/DEFECTIVE LITHIUM METAL BATTERIES“, as applicable.

(3) Cells and batteries which are not subject to the requirements of d) shall be packed in accordance with packing instructions P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.

(4) Lithium cells and batteries liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport shall not be transported except under conditions specified by the competent authority.
Such potentially risky lithium cells and batteries can also be transported without an approval of the competent authority if the following conditions and all conditions of P911 are complied with, if applicable:

(a) the loading or unloading of damaged or defective lithium cell(s)/battery(ies) carried in accordance with this specification in a public place is prohibited. If loading and unloading take place in a separated area of the applicant’s territory or in such an area of the consignee’s or consignor’s territory this requirement deemed to be met.

(b) outer packaging and overpacks shall be so stowed within the Cargo transport unit that they are easily accessible.

(c) additional to the specifications of 5.4 UN Model Regulations “DAMAGED/DEFECTIVE LITHIUM ION BATTERIES” or “DAMAGED/DEFECTIVE LITHIUM METAL BATTERIES” shall be indicated in the dangerous goods transport document.

(d) if substances are used, which are presenting a risk of asphyxiation when used for cooling or conditioning purposes, the conditions of 5.5.3 UN Model Regulations must be complied with.

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P911	PACKING INSTRUCTION

This instruction applies to damaged or defective lithium ion cells and batteries and damaged or defective lithium metal cells and batteries, including those contained in equipment, of UN Nos. 3090, 3091, 3480 and 3481.

(1) All terminals of lithium cells and lithium batteries shall be protected against external short circuit.

(2) All openings for service fluids other than electrolyte shall be closed.

(3) Residues of dangerous goods as well as of the electrolyte on the surface of the outer casing of lithium cell(s) and lithium battery(ies) shall be removed.

(4) Packaging shall conform to the packing group I performance level.

(5) The packaging must be capable to withstand the potential risk scenarios with the type of Lithium-cell/-battery at maximum energy content. The following scenarios must be considered, if applicable:

(a) a rapid disassemble,

(b) a dangerous reaction,

(c) a produce of a flame,

(d) a dangerous evolution of heat, or

(e) a dangerous emission of acute toxic, corrosive or flammable gases or vapours.

(6) The following points must be guaranteed successfully during these scenarios:

(a) The temperature at the outsides of the packaging may not exceed 100°C during the reaction,

(b) Gases or vapours escaping the packaging may not be flammable or acutely toxic. If an escape of flammable or acute toxic gas or vapour cannot be prevented by the construction of the packaging the composed gas must directly be after treated or a change of sufficient air in the load compartment of the cargo transport unit must be guaranteed, so that the flammable or acute toxic gases or vapours outside the packaging developed by venting the Lithium-cell(s)/-battery(ies) are not inflammable, flammable or dangerous or the developed gases or vapours can be purged out of the load compartment without danger.

(c) A damage or explosion of the packaging through developed overpressure must be prevented, e.g. per structural arrangements.

(7) On the audit and its results a technical documentation shall be drawn and the following information have to be listed:

(a) Number of tested lithium cell(s)/battery(ies),

(b) weight of the tested lithium cell(s)/battery(ies),

(c) dimensions of the tested lithium cell(s)/battery(ies),

(d) type of lithium cell(s)/battery(ies) or chemistry of the tested lithium cell(s)/battery(ies),

(e) energy content of the tested lithium cell(s)/battery(ies).

On request the technical documentation must be submitted to the competent authority.

(8) If a packaging has already been successfully tested with a Lithium-cell-/battery-type at maximum

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energy content, this packaging can be used for the transport of other Lithium-cells/-batteries under certain conditions. These conditions are that these cells/batteries correspond to the successfully tested type by construction and by the cell-/battery-chemistry, but have a lower energy content.

(9) The capability of the packaging can either be demonstrated physically with a lithium cell/battery in the respective packaging or alternatively proven by simulated analysis. The following parameters should be considered as a minimum requirement for the analysis, if applicable:

(a) 100% SOC for all lithium cells/batteries inside packaging,

(b) Mass and dimension of the lithium cells/batteries,

(c) Determine available air inside of packaging (oxygen for reaction and heat transfer),

(d) All material properties: Density [$kg \cdot m^{-3}$], specific heat capacity [$J \cdot kg^{-1} \cdot K^{-1}$], heating value [$KJ \cdot kg^{-1}$], thermal conductivity [$W \cdot m^{-1} \cdot K^{-1}$], melting temperature and flammability temperature [K], heat transfer coefficient of the outer packaging [$W \cdot m^{-2} \cdot K^{-1}$] , ambient air temperature 25°C,

(e) Determine energy released with potential chemical reaction per element based on available elements for reaction (e.g. oxygen) for lithium cell/battery and packaging,

(f) Electrical energy to be discharged by a single event

(i) consider worst failure modes based on knowledge on cell(s), module(s) and total battery design,

(ii) total energy conversion within 30 minutes,

(iii) worst case scenario to be analyzed for 24 hours.

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