



**FEBELAUTO NORM ©**

**FOR THE APPLICATION OF THE TAKEBACK OBLIGATION FOR TRACTION BATTERIES OF HYBRID AND ELECTRIC VEHICLES BY THE TAKEBACK POINTS FOR HEV-BATTERIES AND THE MANAGEMENT OF THESE BATTERIES BY THE AUTHORIZED TREATMENT FACILITIES THAT ACCEPT HEV END-OF-LIFE VEHICLES.**

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## **1. Application area of the FEBELAUTO NORM©**

In view of the regional environmental policy agreements which cover the takeback for traction batteries from hybrid and electric vehicles and for which FEBELAUTO has been accredited as management organization, the takeback points and the authorized treatment facilities recognized by FEBELAUTO that accept end-of-life hybrid and electric vehicles and that use the free-of-charge acceptance of HEV-batteries, must meet the requirements of the FEBELAUTO NORM©.

The traction batteries from hybrid and electric vehicles cover more specifically NiMH and Li-batteries and other types of batteries serving the traction of hybrid, plug-in hybrid, and electric (including fuel cell) passenger cars, small commercial vehicles, and motorcycles which fall within the categories M1, N1, of L, and with a weight of 20 kg or more and with a voltage of 60 Volt DC or higher. It concerns batteries as original equipment or batteries from the replacement market. It concerns complete batteries, as well as cells, modules, and stacks if these are being placed separately in the market. These batteries are being named 'HEV-batteries'. These vehicles are being named 'HEV'.

A takeback point can be an official HEV dealer, a HEV-battery dealer, an authorized treatment facility, an independent garage for maintenance and repair, or a salesperson which has been designated by the producer or the management organization for the takeback of reusable and discarded HEV-batteries. The FEBELAUTO NORM© will be applicable for each takeback point that wishes to become or is part of the official network of takeback points. These takeback points are being named 'TBP'.

An authorized treatment facility that accepts end-of-life HEV, is being named 'ATF+'.

An ATF+ can be a TBP for HEV-batteries, but not necessarily.

An ATF+ must meet the requirements of the FEBELAUTO NORM© to accept end-of-life HEV.

An ATF+ which functions also as TBP needs to identify and keep the operations as TBP and as ATF+ separately.

Any TBP and ATF+ that meets the requirements of the FEBELAUTO NORM©, can make use of the free-of-cost collection of HEV-batteries.

The FEBELAUTO NORM© is not applicable for the repair, reuse, and recycling of HEV-batteries, and the repair of HEV. These activities are subject to specific regulation, standards, and safety precautions.

## 2. General Requirements

**Legal Authorization.** The TBP or ATF+ needs to have all necessary legal authorizations, such as environmental, operational and location permits, when these are required by the TBP or ATF+ to conduct operations related to HEV and HEV-batteries.

**Insurance.** The TBP or ATF+ needs to have insurance coverage for 'damage' and for 'civil liability' for the operations with HEV and HEV-batteries in the workplace.

If the TBP or ATF+ is conducting a diagnose, then the TBP or ATF+ needs to have the required permits and insurance coverage against risks related to the execution of such operation.

**Management of HEV-batteries.** The TBP or ATF+ needs to have a management plan. This plan consists of at least the following elements:

- A risk analysis concerning the removal and the storage of HEV-batteries, including intervention procedures which are meeting the codex for the wellbeing in the workplace.
- Identification of the separate storage areas for HEV-batteries which are identified for reuse, second life, or recycling.
- An overview of those operators that need to have a certified educational level according to the requirements of the producer, or according standardized or sectorial training requirements<sup>1</sup> as proposed by FEBELAUTO.

**Removal of HEV-batteries.** The TBP or ATF+ will only remove the HEV-battery from the HEV when:

- Having the instructions of the producer available.
- Limiting the operation only to the removal of the HEV-battery from the HEV, the acceptance of the HEV-battery, the logistics and the packaging for transport.
- Having CE-marked tools available for the removal of the HEV-battery from the HEV, and for the logistics and the packaging for transport.
- Not dismantling the HEV-battery under any circumstances, unless explicit instruction for the producer. In that specific case the TBP or ATF+ must have followed the required training and must have the required tooling.

**Fit for usage.** HEV-batteries, which are no longer fit for use in an HEV (for example by degradation of the electrolyte or the electrodes), can possibly still be used for other (possible stationary) applications. The diagnose of HEV-batteries in view of the use in another applications demands a specific knowledge level and equipment. These diagnose

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(1) <sup>1</sup> For the Belgian sectorial committees 112,142.01, 149.02 and 149.04, specific training modules have been established in view of the collective labor agreements of 11 December 2017.



operations are not part of this FEBELAUTO NORM©, unless what is mentioned in chapter 3.4.

## **2.1. Regulation and instruction which have priority over the FEBELAUTO NORM©**

Every instruction of the producer concerning the safety of HEV-batteries (related to security, removal, transport, logistics operations) which are more important than the FEBELAUTO NORM©, are to be respected with priority.

The regulations concerning prevention and control of electricity and other risks are always applicable.

Every demand from the fire brigade concerning storage, logistics operations for the transport of HEV-batteries needs to be respected and can be subject to audit in view of the proper application of the FEBELAUTO NORM©.

## **2.2. Audit**

Every two years, the TBP or ATF+ has to allow an audit by FEBELAUTO or by a third party assigned by FEBELAUTO for the proper application of the FEBELAUTO NORM©, or to keep the position of TBP or ATF+. The totality of conditions and requirements can be assessed during the audit. The TBP or ATF+ has to be able to document each answer to the audit.

The TBP or ATF+ will appoint a responsible person for the audit that will review the proper application of the FEBELAUTO NORM©.

After receiving the audit report, the TBP or ATF+ informs FEBELAUTO about the result of the audit. The TBP or ATF+ also sends to FEBELAUTO the final report of the auditor for the follow-up (e.g. adjusting measures, etc....).

Not living up to the FEBELAUTO NORM© can result in a temporary or definitive removal of the position of TBP or ATF+. With a definitive removal, the TBP or ATF+ will immediately cease its activities as TBP or ATF+.



### 3. Administrative requirements

The TBP or ATF+ will appoint a responsible person for all administrative and reporting tasks conform the environmental policy agreements.

The administrative requirements as listed in the FEBELAUTO NORM© are in addition to the applicable administrative requirements, such as keeping a waste material register.

#### 3.1. Information - and registration system

The TBP or ATF+ utilizes an information - and registration system to:

- Register and to follow-up the accepted, stored and transported HEV-batteries. To this end, the TBP or ATF+ develops a simple registration system of internal documents concerning each transaction for the acceptance and transport of HEV-batteries. The different transactions are registered chronologically.
- Inform FEBELAUTO on demand concerning the procedures and specific instructions received from the producers. This information will be kept up-to-date annually and be shown during the audit, checking the proper application of the FEBELAUTO NORM©.

The TBP or ATF+ uses an internal information - and registration system, or uses the database provided by FEBELAUTO (directly or via the producer). In case the TBP services different producers, then the use of one type of database is to be preferred.

#### 3.2. Reporting

In view of producing the aggregate data necessary for the reporting by FEBELAUTO to the competent authorities, the electronic reporting has to be done to FEBELAUTO per trimester (at the latest on January 15, April 15, July 15, October 15 of the running calendar year) by:

- The TBP directly, or via the producer.
- The ATF+ directly.

concerning the following data:

- Date of takeback/acceptance of the HEV-battery
- Chemical composition, weight (in case the HEV-battery is complete, mentioning the original weight when that HEV-battery was placed on the market is acceptable, instead of the weighted volume at acceptance), the missing components and its numbers in case the HEV-battery is incomplete, the identification number of the HEV-battery, if available.
- Date of transfer/transport, with indication of the type of destination, at least by category, and with the name and address of the destination:
  - An external diagnostic center.
  - A diagnostic center of the producer, with the HEV-battery under warranty.
  - A diagnostic center of the producer, with the HEV-battery out of warranty.
  - A remanufacturing center of the producer.



- A remanufacturing center, other than of the producer.
- A user with the intention of reuse in a HEV.
- A user with the intention of second life for another application.
- A recycler.
- Collection by FEBELAUTO.

In case the TBP or ATF+ transfers or transports the HEV-battery themselves for treatment and recycling, re-use in the same application, second life in another application, the TBP or ATF+ will report, in addition to the above, the following information:

- The name of the location and the way the accepted HEV-batteries have been treated or have been prepared for reuse, or for second life as HEV-battery in another application.
- The obtained recycling level.
- The obtained recycling efficiency percentage according the Regulation (EC) 493/2012 of 11 June 2012 laying down, pursuant to Directive 2006/66/EC of the European Parliament and of the Council, detailed rules regarding the calculation of recycling efficiencies of the recycling processes of discarded batteries and accumulators.

The documentation concerning the transfer/transport to possible destinations as mentioned above will be stored by FEBELAUTO for a period of at least 20 years.

The TBP or ATF+ indicates explicitly, next to the type of destination, the identity of the legal company or person to whom the HEV-battery was sent.

The TBP or ATF+ will keep the data concerning these HEV-battery and their destination for a period of at least 5 years.

### **3.3. Transfer/transport of HEV-batteries**

The TBP or ATF+ can, if they wish to do so, contact directly the recycling market, the reuse or second life market for automotive or for other applications, unless clearly indicated by the producer within a specific agreement. In the case the TBP or ATF+ takes arrangements by themselves concerning the destination of the HEV-batteries, then the TBP or ATF+ is still obliged to live-up to the administrative requirements as indicated above.

For the HEV-batteries that are transferred for second life in another application, the TBP or ATF+ uses the model agreement for the transfer of responsibilities for the management of these HEV-batteries. The TBP or ATF+ is responsible that the legal company or person taking over the property of the HEV-battery duly signs the model agreement and provide a copy of this to the producer responsibility organization, FEBELAUTO. This model agreement is available on the website of FEBELAUTO.



### **3.4. Diagnose**

In case the TBP or ATF+ is a diagnostic center appointed by the producer, then the TBP or ATF+ needs to keep track of each diagnose conducted and of its results.

The technical data results of the diagnose can be of importance for the potential second life of HEV-batteries for another application, and for the transport of these.

FEBELAUTO could request to receive the results of the diagnose prior to transporting and transferring the HEV- batteries for second life for another application, or for recycling.

## 4. Operational Requirements

### 4.1. General Safety Instructions

The TBP or ATF+ will utilize suitable equipment to eliminate electric risks, when there is a notification of 'HIGH VOLTAGE'.

The TBP or ATF+ will conduct each handling of a HEV-battery with protection against short circuit, heat bridges, water and humidity, the risks of mechanical damage (shocks, drops, deformation, ...) and electrical, magnetic, and chemical risks.

The TBP or ATF+ will conduct each handling of a HEV-battery taking into account the following precautions:

- Always use individual protection equipment, such as insulating gloves.
- Do not connect the positive and negative poles of the HEV-battery together, or connect conductive materials.
- Never dismantle or open a HEV-battery or components such as modules and cells without explicit agreement of the producer.
- Never place the HEV-battery under extreme mechanical pressure, to risks of static electricity, to water and humidity, to heat and heat sources of over 60° C.
- Do not put HEV-batteries into sunlight.
- Store the HEV-batteries in a dry, cool, ventilated and covered concrete building (see 4.3)
- Discarded HEV-batteries need to be stored in accordance with the applicable legal requirements
- A separate location to store HEV-batteries is required, under supervision and only accessible by trained personnel, having received the authority of the employer.

The TBP or ATF+ takes the following precautionary measures to avoid indirect risks:

- Inspect the secured electrical installations.
- Only use electric equipment in perfect conditions.
- Never cut the cables.
- Insulate the tools used for the handling of the HEV-battery.
- Make available the prescriptions for urgent interventions.

The TBP or ATF+ respects the following safety requirements when HEV-batteries are presented for transport:

- Secure upfront the electrical installation where the personnel works, and secure and identify clearly the working zone.
- Completely close the installation and provide the necessary isolation.
- Protect against renewed current.
- Check whether installation is not under high voltage.
- Avoid short circuits.

- Protective measures to be taken when actions take place in nearby areas which are under high voltage.

#### **4.1.1. Safety Instructions handling an HEV-battery**

The TBP or ATF+ follows the instructions of the producer.

The TBP or ATF+ takes into account the internal security system in the HEV battery such as the short-circuit system, the cooling system and insulation, prior to remove, store or logistics handling of the HEV-battery.

The TBP or ATF+ is familiar with the characteristics of the HEV-battery (chemical content, assumed weight, dimensions), the condition of the HEV-battery (used, damaged, defective, waste), prior to removal and logistics handling.

The TBP or ATF+ decides on the correct packaging and transport method for further transport. HEV-batteries are considered dangerous goods, class 9 according the UN 3480-classification. The transport needs to meet the requirements concerning information, pictogram, packaging specifications, and administrative declarations, as defined per condition or state of the HEV-battery.

The TBP or ATF+ does not dismantle the removed HEV-battery, unless authorized by the producer, and by following specific instructions.

#### **4.1.2. Safety Equipment**

The TBP or ATF+ is requested to have at least the following safety equipment:

- Insulated equipment for dismantling: fixed frame or movable device, or hydraulic ramp.
- Lifting beam, CE marked, insulated and shock- protected.
- Handling equipment to move and store HEV batteries.
- Voltage detection appliance.
- Battery safety sealing stopper.
- Protective equipment such as insulating blanket, facial protection, insulating gloves, safety helmets, safety shoes, current clamps, heat detector, tools to detect humidity or chemical leakage.

It is also recommended that the TBP or ATF+ have:

- Ideally, devices that allow for the detection or analysis of risks, such as "insulation control device – current clamps", equipment for detecting leaks (heat, humidity, chemical leaks).
- In addition to the minimum intervention equipment (mobile fire extinguishers;...) required for security checks, spare equipment that can be used by the internal intervention team, appointed by the employer.



#### **4.2. Requirements for takeback**

The TBP or ATF+ that functions as TBP and as such has been appointed by the producer or FEBELAUTO, accepts free-of-charge complete HEV-batteries from the last holders according to the requirements as listed in the environmental policy agreements.

The TBP or ATF+ that functions as TBP and as such has been appointed by the producer or FEBELAUTO, accepts free-of-charge separate modules, stacks or cells from the last holders if these modules, stacks or cells have been placed separately on the market by the producer according to the requirements as listed in the environmental policy agreements.

#### **4.3. Storage conditions**

The TBP or ATF+ takes care of a separate storage location for those HEV-batteries designated for reuse, second life or for recycling.

The storage of discarded HEV-batteries must take place in a covered location with a sealed floor or in weatherproof and acid proof containers.

The HEV batteries are stored in a dry place (humidity below 45%, to avoid the possibility of condensation), cool (temperature below 30°C), ventilated and covered, in a concreted construction (or similar) equipped with a liquid collection system ( see recommendations in appendix).

The storage of discarded HEV-batteries may not have any risks for storage, logistics handling or possible reuse, second life or recycling of other waste present.

The logistics handling in view of the transport of HEV-batteries towards another destination takes place in a secured area special for HEV-batteries conform to the environmental and site permits, and warrants that no mixing with other waste streams can take place during the management of the HEV-batteries.

The depollution, dismantling and destroying of end-of-life vehicles and the storage of the waste and materials coming from the depollution and dismantling of end-of-life vehicles takes place in an enclosed zone separate from the storage area of the HEV-batteries. Disconnecting the HEV-battery needs to take place as soon as possible after the arrival of the end-of-life HEV on the site location to reduce any risk of an incident or accident. End-of-life HEV with HEV-batteries that have not yet been disconnected, must be stored in a separate area, to avoid any contact with other end-of-life vehicles or other fire-risk waste materials.

The areas where End-of-life HEV with HEV-batteries that not have yet been disconnected are stored, and where HEV-batteries are stored need both to be clearly indicated on the site location.



The storage area for damaged and/or defective HEV-batteries is enclosed according to the requirements indicated in the FEBELAUTO NORM©, or in the requirements of the fire brigade. FEBELAUTO needs to be informed of these requirements.

#### **4.4. Requirements for packaging and transport**

The TBP or ATF+ will always apply and respect the legal requirements concerning transport of HEV-batteries according to the UN transport regulation, as well as the legal requirements for the transport of waste materials as applicable in the respective Regions in Belgium.

The TBP or ATF+ will only allow registered waste collectors or traders to collect the discarded HEV-batteries. When discarded HEV-batteries are exported to another EU Member State, or outside the EU, the TBP or ATF+ must have the approved notice conform to the European Regulation 1013/2006 on shipments of waste, unless the competent authorities do not require notice for the batteries concerned.

The packaging for the transported HEV-battery shall, in case of necessity, contain security against short circuit by protection of the poles, and against any contact of the battery or cells by using non-conductive materials.

The TBP or ATF+ will provide to the registered waste collector status report about the transport conditions. The model of such status report can be found on the website of FEBELAUTO.

The TBP or ATF+ shall, as sender, include a document indicating the condition or state of the HEV-battery. More specifically, the TBP or ATF+ shall, as the sender, indicate whether the HEV-battery has to be shipped as waste or as a product conform to the viewpoint of OVAM, unless:

- The receiver decides that the HEV-battery needs to be shipped as waste, and to be received as waste. In that case, the TBP or ATF+ that organizes the shipment or FEBELAUTO on which the TBP or ATF+ relies, shall in advance check the permit of the receiver for the acceptance of discarded HEV-batteries.
- Unless otherwise indicated by FEBELAUTO or the regional competent authorities, HEV-batteries coming from an ATF+ shall be considered as waste material.

HEV-batteries with the following characteristics are to be considered damaged or defective HEV-batteries:

- Sudden increase of temperature.
- Production of a flame, emission of gas, steam, or toxic, flammable or corrosive liquids.
- Heat, humidity or chemical leakage or release.
- Clear deformation of the battery as a whole or of cells, modules, or stacks.

In case the HEV-battery shows any of the above characteristics, the HEV-battery can be considered hazardous waste according the requirements of the regional competent authorities and the related duties need to be followed accordingly.

For the transport of damaged and defective HEV-batteries, the packaging shall consist of the following minimum conditions (as required by the ADR regulation): individual packaging of each HEV-battery (or cell, module, or stack, based on product configuration), packaging suitable against leakage, packaging with robust closing mechanism, reduction of the impacts of vibrations and shocks, precaution measures against movement of the HEV-battery in the packaging, use of non-flammable, non-conductive filling material, and the presence of absorbing material in the case of release of electrolyte.

## 5. Educational requirements

The different types of training have as objectives:

1. To recognize the types of HEV-batteries, including the general characteristics and potential risks.
2. Providing knowledge enabling to execute safely the different operational activities by the HEV-trained operators in the TBP or ATF+.
3. To provide additional knowledge concerning the acceptance or removal of HEV-batteries, concerning the management and control of work procedures, and concerning the execution of safety procedures.

On the basis of the training and prior to any handling of a HEV, the TBP or ATF+ shall appoint a HEV-competent person for:

- The supervision of the acceptance and handling of HEV-batteries.
- To put in writing, respect and adjust when needed, all safety requirements related to the logistics handling of HEV-batteries.

The TBP or ATF+ shall provide a written authorization to the HEV-trained operators enabling them to work on HEV. This authorization shall be delivered by the employer after completion of the training concerning the safety requirements and technical skills needed to work on HEV, however without dismissing the responsibility of the employer. The authorization shall be provided on the basis of the different job activities to be performed and on the basis of the competencies of the HEV-trained operators.

The TBP or ATF+ shall appoint a HEV-competent person who will be the responsible contact for the safety on the site location. This person shall have followed the training and accreditation modules proposed by the producer, or by FEBELAUTO. This HEV-competent person shall in addition develop a test procedure for the HEV-trained operators of the TBP or ATF+ that is responsible for the acceptance and possible logistics handling of the HEV-batteries. This test will be conducted at least once per year and needs to be documented for follow-up control: names, pictures, procedures, presence, signatures, test vehicle, test battery. The HEV-competent person is responsible for the evaluation and for applying the procedures to disconnect the current of the HEV.

Each relevant change to the work conditions such as function, skills, type and cause of danger, risk level, technical changes, will be subject to a review of the required competences.

## 6. Urgent interventions

The TBP or ATF+ develops an intervention plan which needs to be followed in case of an accident caused by the use, the storage or the logistics handling of HEV-batteries. That intervention plan needs to be approved by the fire brigade. In case of any change, the new plan needs also to be approved by the fire brigade.

In case the content of a HEV-battery is being released by accident, in the absence of fire, the following points of attention need to be considered:

- The release of electrolyte can result in the formation of irritating acids.
- Use individual protection equipment, ventilate the storage area, avoid any contact with skin and eyes.
- Protect respiration tracks, hands, eyes and skin.
- Inform the emergency services and keep the safety sheets of the HEV-batteries at the disposal of the emergency services.

In case of fire, the following points of attention need to be considered:

- When a small fire, put dry material such as vermiculite, sand, foam and sodium carbonate on top of the source of fire.
- When a large fire, use large amounts of water as a cooling method to avoid that the heat can spread to other HEV-batteries. Protect the respiration tracks to avoid the impact of toxic materials of flammable by-products.

In case of exposure to high voltage, the following points of attention need to be considered:

- High voltage can create electric shocks and electrocution.
- Use insulated gloves and, if possible, disconnect the source of electricity and remove any victim by using non-conductive equipment.
- Call the emergency services, doctors to check first signs of life. Avoid shocks, inform the emergency services and keep the safety sheets of the HEV-batteries available.
- Request doctors' advice after an electric shock to check whether internal body damage is noticeable with the victim.
- Protect the environment by:
  - Take measures to avoid leakage of materials and fluids into the soil, sewers, or waters.
  - Use inert absorbing materials such as sand and sawdust.
  - Inform the authorities responsible for the protection of the environment.

The TBP or ATF+ makes the FEBELAUTO NORM© available at all times for the HEV-operators authorized to work on HEV and EV-batteries.

## 7. Some interesting websites and information

**FEBELAUTO:** [www.febelauto.be](http://www.febelauto.be)

- Environmental Policy Agreement (MBO) concerning traction batteries for hybrid and electric vehicles (HEV) of the Flemish Region.
- Model agreement for the transfer of HEV-batteries for reuse or for second life in another application.
- Model of a status report.
- Batteries.
- Legislation.

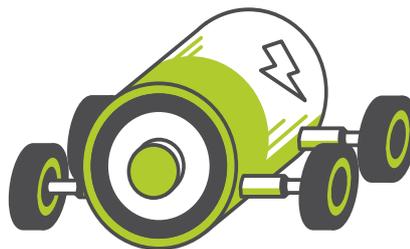
**ADR information for the road transport of dangerous goods:** [www.gevaarlijke-stoffen.be](http://www.gevaarlijke-stoffen.be)

**Federal Authorities:** [www.werk.belgie.be](http://www.werk.belgie.be)

**Flemish Region:** [www.ovam.be](http://www.ovam.be)

**Brussels Region:** [www.leefmilieu.brussels/themas/afvalgrondstof/afvalbeheer](http://www.leefmilieu.brussels/themas/afvalgrondstof/afvalbeheer)

**Walloon Region:** [www.environnement.wallonie.be](http://www.environnement.wallonie.be)



## APPENDIX 1: Recommendations for the safe storage of Li-ion batteries

This annex aims to provide recommendations for the management of the storage space for Li-ion batteries. The advice of the fire service always takes priority above these recommendations.

1. Always ask the local fire and emergency services for written advice about the storage conditions of Li-Ion batteries. That advice always prevails.
2. The Li-ion batteries are stored in a dry, orderly, cool and sufficiently ventilated place. Ideally, it is a building with walls and door Rf «1h min», or a container with the same level of protection (see below). The necessary signage is provided and is included in the company's global intervention plan. The building / container is limited in area and, ideally, compartmentalized to limit the spread of fire caused by the batteries (see below).
3. The ideal storage temperature for the Lithium batteries is approximately 10 to 15°C. A storage temperature of maximum 30° C must be guaranteed due to the fact that:
  - At a higher storage temperature the battery will discharge itself more quickly. This in itself is not a problem for storage as long as the state of charge (SoC) is in the correct condition.
  - Temperatures below freezing cannot damage good batteries, if the temperature is limited to 10°C. To prevent damage, these batteries must be brought back to a temperature above the freezing threshold (> 0C °) before recharging or using them.
4. The humidity should not exceed 50% (for undamaged batteries)
  - If the humidity is too high, condensation problems can be triggered on the connectors (terminals), which increases the risk of short circuit, temperature rise and spontaneous explosion (thermal runaway).
  - To limit these risks of condensation, it is strongly recommended to protect the connectors.

Ideally, these storage areas should have negative pressure.

5. Battery State of Charge (SoC)
  - The phenomenon of gradual self-discharge is normal. A lithium battery discharges an average of 5% in the first 24 hours after charging. After that, the battery discharges an average of 3 to 5% per month (for undamaged batteries).
  - Immediate use of a Lithium battery generally requires a SoC of +/- 40 to 50%.
  - Too low or too high voltage in the Cells can damage the battery components and consequently the normal functioning of the battery.
  - The battery voltage check is best performed under the following conditions:
    - o Battery recently not quickly charged or discharged
    - o At room temperature (see above)
    - o In a "vibration-free" environment

6. The storage and packaging conditions must comply with the regulations and provisions for Li-ion batteries included in the ADR regulations<sup>2</sup> (original packaging or comparable or special packaging). In particular, damaged or unstable batteries must be stored in complete safety in specially designed containers (surveillance system, fire extinguishing equipment, fire and isolation compartment). This container is located in a separated (quarantine) zone.

Stacking pallets with batteries is not allowed. For safety, the batteries are best stored in the original or a comparable packaging. They can be stored on a pallet, but securely tied to prevent it from falling and sliding.

7. In case of fire from batteries, various toxic fumes are released (hydrogen fluoride,...). The intervention team, company personnel and the neighborhood can be exposed to these toxic or corrosive fumes as well as to the effects of extinguishing such as contaminated water. This must be included in the intervention plan.
8. Batteries have to be handled with care. The start of a fire can be initiated by:
  - Shock mechanism (drop, push, ..)
  - Short circuit (humidity, ...)
  - Overload or total discharge
  - ...
  - An external fire spreading towards batteries (Temperature...).

Note:

All conditions that may have influence on the battery during its storage period are recorded and transferred by the request for transport by the TBP or ATF+. This information determines whether or not the battery to be collected is "safe for transport".

9. Equipment
  - Storage of small quantities and modules (size and weight limited to "portable"): This storage (max. 5 to 6 pieces) can take place in drums (metal / plastic) ADR compliant and securely tied. The drums are filled with insulation material (vermiculite, etc....), top and bottom insulation layer of at least 10 cm and against the walls of the storage container of at least 5 cm. Approved flame retardant bags can also be used. The number of barrels must be limited (see permit). UN approved packaging is required (the approval code is visible on the container).
  - A fire-resistant storage area is taken into use for the storage of larger quantities (see applicable standards). Ideally, this storage area is equipped with charging points that will immediately stop the process if a fire extinguishing system is activated. Ideally, this storage space is equipped with:
    - o Alarm system
    - o CO and Smoke detection system
    - o Venting system for flue and combustion gases (non-combustible materials, preventing the accumulation of explosive gases)

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<sup>2</sup> European agreement concerning the international carriage of dangerous goods by road (ADR).

- Fire detection system (smoke detector or thermal detection cable) and, if necessary, automatic extinguishing system
  - “Spark-free” indoor lighting.
- A storage space on a larger scale (> 20 pallets or > 100 units) in addition to the above-mentioned facilities, compartmentalization of the storage space with limited height and ideally provided with a fire and emergency door.

**Note:**

A collection system for the extinguishing water must be provided at the store.

