

EUROPEAN COMMISSION Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs

Goods in the Single Market and Enforcement Standardisation

Brussels, 15.10.2020

# A Notification under Article 12 of Regulation (EU) No 1025/2012<sup>1</sup>

# Subject matter related to

	Annual Union Work Programme for European standardisation (Art. 12, point a)
$\square$	Possible future standardisation requests to the European standardisation organisations
	(Art. 12, point b)
	Formal objections to harmonised standards (Art. 12, point c)
	Identifications of ICT technical specifications (Art. 12, point d)
	Delegated acts to modify Annexes I or III of Regulation (EU) No 1025/2012 (Art. 12,
	point e)

### Title of the initiative

Draft standardisation request to the European standardisation organisations as regards performance, safety and sustainability requirements for batteries

# Additional information

Legislative reference(s)	COM(2020) 640 final of 11.12.2019 The European Green Deal
EN reference(s)	-
Status	Draft
Other information	This draft has not been adopted or endorsed by the European Commission. Any views expressed are the preliminary views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission. The information transmitted is intended only for the Member State or entity to which it is addressed for discussions and may contain confidential and/or privileged material.
<b>Deadline for feedback</b>	10.11.2020

### **Commission contact point for this notification**

<sup>1</sup> OJ L 316, 14.11.2012, p. 12

Commission européenne/Europese Commissie, 1049 Bruxelles/Brussel, BELGIQUE/BELGIË - Tel. +32 22991111 http://ec.europa.eu/growth/single-market/european-standards/notification-system/index\_en.htm

Luxembourg, XXX [...](2020) XXX draft

# COMMISSION IMPLEMENTING DECISION

# of XXX

on a standardisation request to the European standardisation organisations as regards performance, safety and sustainability requirements for batteries

(Text with EEA relevance)

(Only the English, French and German texts are authentic)

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#### COMMISSION IMPLEMENTING DECISION

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#### on a standardisation request to the European standardisation organisations as regards performance, safety and sustainability requirements for batteries

#### (Text with EEA relevance)

#### (Only the English, French and German texts are authentic)

#### THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council,<sup>1</sup> and in particular Article 10(1) thereof,

Whereas:

- (1) The Commission is required to revise the Batteries Directive 2006/66/EC. Following the adoption of the Strategic Action Plan on Batteries<sup>2</sup>, the Commission is also required to include in the revised regulatory framework requirements related to the sustainability and safety of batteries. Such requirements should help the internal market to operate more seamlessly and improve the environmental performance of batteries.
- (2) The adoption of a new regulatory framework for batteries is mentioned as a key deliverable in support of the Strategic Action Plan on Batteries in the Annex to the Commission's Communication A European Green Deal<sup>3</sup>
- (3) The intention to request drafting of European standards and European standardisation deliverables in support of the Strategic Action Plan on Batteries was stated in point 2.3 of the Union work programme for European standardisation for 2019<sup>4</sup> and in its accompanying Staff Working Document<sup>5</sup>.

<sup>&</sup>lt;sup>1</sup> OJ L 316, 14.11.2012, p. 12.

<sup>&</sup>lt;sup>2</sup> Annex to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - On the Move, Sustainable Mobility for Europe: safe, connected and clean

<sup>&</sup>lt;sup>3</sup> COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS The European Green Deal COM/2019/640 final

<sup>&</sup>lt;sup>4</sup> COM(2018) 686 final

<sup>&</sup>lt;sup>5</sup> SWD(2018) 434 final

- (4) It is appropriate to already request the European standardisation organisations to draft new European standards that could be used in support of the revised regulatory framework for batteries and more in general to support the Union's policy objective to improve the environmental performance of batteries.
- (5) Those European standards should be adopted by the European standardisation organisations by the deadlines set in this Decision. Given that the execution of the request may require more time than initially foreseen, it may be necessary to extend those deadlines taking into account the progress made in the implementation of the work programme prepared by the European standardisation organisations for the execution of the request. It may therefore be necessary to review the respective deadlines accordingly.
- (6) European standards should help ensure high level of environmental performance of batteries. Given that such European standards are technology-neutral and performance-based, they also contribute to ensuring equal conditions of competition among relevant economic operators dealing with these products, in particular small and medium-sized enterprises. Indirectly those European standards also contribute to lower operating costs benefitting consumers in particular.
- (7) European standards should include detailed technical specifications to facilitate the verification of applicable requirements. They should also reflect the generally acknowledged state of the art.
- (8) Recalling that all relevant interested parties, including the Member States and the European stakeholder organisations receiving Union financing in accordance with Regulation (EU) No 1025/2012, may identify needs to develop additional standards, it may be necessary to consider adding new items to the list of European standards set out in Annex I to this Decision. It may therefore be necessary to adjust the scope of this request accordingly.
- (9) The European standardisation organisations (ESO) have agreed to follow the Guidelines for the execution of standardisation requests.
- (10) In order to ensure transparency and facilitate the execution of the requested standardisation activities CEN and Cenelec should prepare a work programme and submit it to the Commission.
- (11) In order to enable the Commission to better monitor the requested standardisation work, CEN and Cenelec and should provide the Commission with access to an overall project plan containing detailed information on the execution of the standardisation request. CEN and Cenelec should promptly inform the Commission if they consider that additional European standards would need to be developed or if they consider that more time is necessary for the execution of this request.
- (12) In accordance with Article 10(3) of Regulation (EU) No 1025/2012 each standardisation request is subject to acceptance by the relevant European standardisation organisation. It is therefore necessary to provide for the rules on validity of this request if it is not accepted by CEN and Cenelec.
- (13) In order to ensure legal certainty as to the validity of the request after its execution, it is appropriate to provide for a date of expiry of this Decision. Given that the execution of the request may require more time than initially foreseen, it may be necessary to extend the date of expiry taking into account the progress made in the implementation of the work programme prepared by CEN and Cenelec for the execution of the request.

- (14) The European standardisation organisations and the European stakeholders' organisations receiving Union financing have been consulted.
- (15) CEN and Cenelec have indicated that the work covered by the request falls within their area of competence.
- (16) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 22 of Regulation (EU) No 1025/2012.

#### HAS ADOPTED THIS DECISION:

#### Article 1

#### Requested standardisation activities

The European Committee for Standardisation (CEN), the European Committee for Electrotechnical Standardisation (Cenelec) are requested to draft new European standards and European standardisation deliverables listed in Table [1] of Annex I to this Decision.

The standards referred to in the first paragraph shall meet the requirements set out in Annex II.

# Article 2

#### Work programme

CEN and Cenelec shall prepare joint work programmes indicating all the standards referred to in the first paragraph of Article 1, the responsible technical bodies and a timetable for the execution of the requested standardisation activities in line with the deadlines set out in Annex I.

CEN and Cenelec shall submit the draft joint work programmes to the Commission 6 months after the notification of this Decision by the Commission] and provide it with access to an overall project plan.

CEN and Cenelec shall inform the Commission of any amendments to the joint work programme.

# Article 3

### Reporting

1. CEN and Cenelec shall report annually to the Commission on the execution of the request referred to in Article 1 indicating the progress made in implementation of the work programme referenced to in Article 2.

2. They shall submit the first annual joint report to the Commission by 12 months after notification of this Decision by the Commission.

3. CEN and Cenelec shall provide the Commission with the joint final report by the last day of the 24th month after notification of this Decision by the Commission.

4. Without prejudice to the reporting obligations set out in paragraphs 1 to 3, CEN and Cenelec shall promptly report to the Commission any major concerns relating to the scope of the request referred to in Article 1 and the deadlines set out in Annex I.

# Article 4

### Standards

The European standards developed on the basis of the request referred to in Article 1 of this Decision shall refer to this Decision.

CEN and Cenelec shall include in each revised standard information on significant changes that were introduced in that standard.

CEN and Cenelec shall provide the Commission with the titles of the requested European standards in all the official languages of the Union.

#### Article 5

### Validity of the standardisation request

If CEN or Cenelec do not accept the request referred to in Article 1 within a month of receiving it, the request may not constitute a basis for the standardisation activities referred to in that Article.

This Decision shall expire on [date].

#### Article 6 Addressees

This Decision is addressed to the European Committee for Standardisation and the European Committee for Electrotechnical Standardisation.

Done at Luxembourg,

For the Commission [...]

Member of the Commission

# ANNEX I

# List of new standards and European standardisation deliverables to be drafted as referred to in Article 1

Table 1:	List	of	new	harmonised	standards	and	European	standardisation
deliverables to be drafted and deadlines for their adoption								

	<b>Reference information</b>	Deadline for the adoption <sup>1</sup> by the ESOs		
1	European standard on performance and durability aspects of primary (non-rechargeable) batteries	36 months after notification of this Decision to the ESOs		
2.	European standard on performance and durability aspects of rechargeable batteries with internal storage	36 months after notification of this Decision to the ESOs]		
3.	European standard on the reuse and repurposing of rechargeable batteries with internal storage	36 months after notification of this Decision to the ESOs		
4.	European standard on safety aspects of stationary battery energy storage systems with internal storage	36 months after notification of this Decision to the ESOs		

<sup>&</sup>lt;sup>1</sup> 'Adoption' refers to the relevant European standardisation organisation making an adopted standard available to its members or the public.

# ANNEX II

# **Requirements for the standards referred to in Article 1**

# Part A. Specific requirements for drafting new standards listed in Table 1 of Annex I

# 1. Requirements for all standards

Standards shall reflect the generally acknowledged state of art. They shall take into account existing international standards, in particular at IEC/ISO level.

# 2. Requirements for specific standards

# **2.1 Standard on performance and durability aspects of primary (non-rechargeable)** batteries listed in point 1 of Table 1 of Annex I

The standard shall describe the measurement methods necessary for the determination of the performance and durability of general-purpose primary portable batteries.

In particular, it will describe the procedure and conditions for the measurement of the following parameters:

- Battery charging capacity, in Ah;
- Minimum average duration (MAD) or Minimum Permitted Operating time, in hours;
- Delayed discharge performance (shelf life), in percentage of the MAD limit for the model concerned;
- Leakages, ascertaining that during testing no leakage occurs.

If justified, CEN and CENELEC may propose to the European Commission to add new parameters to this list or to broaden the scope in terms of chemistries and battery formats concerned.

The proposed measurement methods for the determination of the parameters mentioned above shall be in accordance with the conditions of IEC 60086-1:2015 Primary batteries - Part 1: General conditions. Some of the parameters mentioned need the testing of the operating time in various applications depending on the type of battery. Designations in IEC 60086-2:2015 Primary batteries - Part 2: Physical and electrical specifications, shall be used to specify the battery model concerned.

To carry out the proposed standardisation work, CEN and CENEEC shall consider the two standards mentioned above, as well as any other international standard that they consider relevant. In addition, the approaches adopted within the 'Nordic Swan Ecolabel' system will also be taken into consideration<sup>2</sup>.

# **2.2 Standard on performance and durability aspects of rechargeable batteries with internal storage listed in point 2 of Table 1 of Annex I**

The standard shall describe the necessary steps and conditions for the measurement of the following parameters:

- Rated capacity (in Ah) and rated capacity fade (in %)
- Rated power (in W) and rated power fade (in %)

<sup>&</sup>lt;sup>2</sup> Nordic Ecolabelling for Primary batteries, see <u>http://www.nordic-ecolabel.org/product-groups/group/?productGroupCode=001</u>

- Internal resistance (in  $\Omega$ ) and internal resistance increase (in %)
- Energy round trip efficiency (in %)
- Expected lifetime (including both calendar and electrochemical ageing)

The measurement tests shall be designed to be relevant for batteries and battery packs<sup>3</sup> intended for the following applications:

- Motor vehicles, including M and N categories<sup>4</sup> with traction battery
- L-category<sup>5</sup> vehicles with traction battery
- All other wheeled personal mobility devices falling out of scope of the L-category vehicles, such as electric bicycles and electric scooters
- Stationary battery energy storage systems

For batteries used in the vehicle categories listed above, as well as in other applications, including agriculture (e.g., utility tractors), railway, aviation, marine (e.g. commercial vessels, leisure boats), mining, construction equipment and material handling (e.g., forklifts, terminal tractors), standardisation bodies will determine whether specific measurement test are required, or whether generic measurements tests can be applicable.

The standard shall develop accelerated ageing test methods for performance degradation using a number of defined charging and discharging cycles and cycling protocols, which are necessary for the measurement of the referred to parameters, in a way that is unambiguous, representative of each relevant application, and which reflects widely accepted practice.

The accelerated ageing testing protocols for the determination of the estimated capacity fade should consider the combination of calendar and cycling modes. In the case of on-road electro-mobility applications, testing cycles should reflect the usage of vehicles in real life applications and different vehicle types and models. The standard shall also specify the methodology for continuous capacity fade estimations during the battery life. If relevant, the standard shall propose verification tolerances to allow for measurement uncertainties.

There are currently numerous procedures and protocols for accelerated ageing test to estimate capacity fade and internal resistance increase. In case more than one procedure is described for the determination, equivalence methods should be included in the standard.

The standard shall also define the conditions for assessing the initial parameters of the battery, the conditions and periodicity for the recurring evaluation of the battery, if applicable, as well as the conditions for defining the termination of the testing (such as temperature and state of charge).

The characterisation of the capacity fade/retention and the increase in internal resistance are of particular importance, due to their relevance as indicators for cost efficiency over time. The calculation of values for these parameters could be used, in the future, for the introduction of legal lifetime guaranties for batteries.

Standardisation bodies are encouraged to develop more sophisticated performance degradation tests, such as accelerated stress testing, for both mobility and stationary applications, on which future regulatory requirements might be based. Such standardisation

<sup>&</sup>lt;sup>3</sup> For the purpose of this request, 'battery pack' means any source of electrical energy constituted by batteries or groups of cells that are connected together and/or encapsulated within an outer casing so as to form a complete unit ready for use that the end-user is not intended to split up or open

<sup>&</sup>lt;sup>4</sup> According to Article 2 of Regulation (EU) 2018/858,

<sup>&</sup>lt;sup>5</sup> As defined in Regulation EU 168/2013

work should take into account ongoing work on in-vehicle durability requirements being developed by the Electric Vehicles and the Environment Informal Working Group of UNECE (United Nations Economic Commission for Europe).

Relevant existing international and European standards include:

- ISO 18243:2017 (EN ISO 18243:2019) Electrically propelled mopeds and motorcycles Test specifications and safety requirements for lithium-ion battery systems
- ISO 13064-1:2012 Battery-electric mopeds and motorcycles Performance Part 1: Reference energy consumption and range
- ISO 13064-2:2012 Battery-electric mopeds and motorcycles Performance Part 2: Road operating characteristics
- ISO 12405-4:2018 Electrically propelled road vehicles —Test specification for lithium-ion traction battery packs and systems Part 4: Performance testing
- SAE J1798:2008 Recommended Practice for Performance Rating of Electric Vehicle Battery Modules
- SAE J2288:2008 Life Cycle Testing of Electric Vehicle Battery Modules
- IEC 61982:2012 (EN 61982:2012) Secondary batteries (except lithium) for the propulsion of electric road vehicles Performance and endurance tests
- IEC 61660-1:2018 Secondary Li-ion cells for the propulsion of electric road vehicles. Part 1: Performance testing
- IEC 62576:2018 (EN 62576:2010) Electric double-layer capacitors for use in hybrid electric vehicles Test methods for electrical characteristics
- ISO 18300:2016 Electrically propelled vehicles -- Test specifications for lithiumion battery systems combined with lead acid battery or capacitor
- IEC 61427-2:2013 (EN 61427-2:2015), IEC 61427-1:2013 (EN 61427-1:2013) -Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 2: On-grid applications; Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 1: Photovoltaic off-grid application
- IEC 62620:2014 (EN 62620:2015) Secondary cells and batteries containing alkaline or other non-acid electrolytes Secondary lithium cells and batteries for use in industrial applications
- IEC 63115-1:2020 (EN IEC 63115-1:2020) Secondary cells and batteries containing alkaline or other non-acid electrolytes Sealed nickel-metal hydride cells and batteries for use in industrial applications Part 1: Performance
- IEC 62984-3:2020 (EN IEC 62984-3:2020)- High-temperature secondary batteries Part 3: Sodium-based batteries Performance requirements and tests
- IEC 61960-3:2017 (EN 61960-3:2017) Secondary cells and batteries containing alkaline or other non-acid electrolytes Secondary lithium cells and batteries for portable applications Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them

# **2.3** Standard on the reuse and repurposing of rechargeable batteries with internal storage listed in point 3 of Table 1 of Annex I

The standard shall include all the necessary provisions to facilitate the reuse<sup>6</sup> and repurposing<sup>7</sup> of batteries packs and modules.

#### 1. Design

The standard shall include guidance on how to ensure that design (e.g., modular design) and assembly techniques (e.g., reversible assembly) facilitate the maintenance, repair and repurpose of batteries and battery packs.

It shall furthermore describe, if appropriate, standard configurations on the number of cells per module and number of modules per battery pack, so as to facilitate inter-operability, as well as their reuse and repurposing. Such guidance should be formulated in a way that it does not hold back innovation or technological innovation.

It shall also describe how assembly techniques can be used that do not prevent the reuse, repair, repurpose and recycling of battery cells and modules. It shall explain how disassembly operations should be performed, including targeting certain components, and how the use of standardised tools may facilitate such disassembly.

Relevant existing international standards include:

- DOE-INL/EXT-15-34184 (2015): U.S. DOE Battery Test Manual for Electric Vehicles
- DOE-INL/EXT-07-12536 (2008): Battery test manual for plug-in hybrid electric vehicles
- IEC 62984-3-2:2017: High Temperature Secondary Batteries Part 3: Sodium-based batteries Section 2: Performance requirements and tests
- ANSI/CAN/UL 1974:2018 Standard for Evaluation for Repurposing Batteries
- 2. Diagnostics and determination of the State of Health (SoH)

Economic operators with a legitimate interest in pursuing second life applications of retired batteries from electric vehicles will need accurate estimates of their remaining capacity and overall State of Health<sup>8</sup> (SoH) to take informed decisions. Given the myriad of existing, incompatible ways to estimate the batteries SoH, it seems appropriate to undertake standardisation work in this area.

The standard shall describe the procedure(s) for the determination of the State of Health (SoH) of batteries, which is instrumental to inform economic decisions on their repair, reuse and repurpose. This diagnostic is very likely to require access to certain data on battery usage and history, normally stored in the Battery Management System (BMS). The procedure should be robust and precise, as it might be used for the certification of batteries at the end of

<sup>&</sup>lt;sup>6</sup> For the purpose of this request, 're-use' means any operation by which batteries, battery packs or their components that are not waste are used again for the same purpose or application for which they were conceived.

<sup>&</sup>lt;sup>7</sup> For the purpose of this request, 'repurposing' means any operation that results in parts or the complete battery being used for a different purpose or application than the one that the battery was originally designed for.

<sup>&</sup>lt;sup>8</sup> For the purpose of this request, 'state of health' means a measure of the general condition of a rechargeable battery and its ability to deliver the specified performance compared with its initial condition.

their first life, with a view to providing a reliable estimate of its remaining capacity and expected behaviour.

The standard shall describe which technical parameters data should be stored in the BMS, which are necessary for the determination of the SoH, and, where necessary, shall propose standardised data formats for storage and access to them through an open data diagnostics connector.

There are currently numerous procedures and algorithms to calculate and estimate values for the SoH. In case more than one procedure is described for the determination of the SoH, equivalence methods should be included in the standard.

Standardisation work should take into account ongoing work on the on-board display of EV batteries' State of Health being developed by the Electric Vehicles and the Environment Informal Working Group of UNECE (United Nations Economic Commission for Europe)

If necessary, the standard shall include separate applicable procedures for lithium-ion and for chemistries other than lithium-ion.

Relevant existing international standards include:

- ANSI/CAN/UL 1974, Evaluation for repurposing batteries
- SAE J2950, SAE J2997 Standards for Battery Secondary Use
- DOE-INL/EXT-15-34184 (2015): U.S. DOE Battery Test Manual for Electric Vehicles
- DOE-INL/EXT-07-12536 (2008): Battery test manual for plug-in hybrid electric vehicles

### 3. Battery evaluation for repairing or repurposing

The use of retired batteries from EVs in second life applications is likely to increase significantly in the near future. Likewise, the substitution of the failing components of a battery or battery pack may be required in some cases to ensure that it performs its functions as it was initially designed.

These operations require a detailed assessment of individual battery modules and cells to determine their ability to be reused and repurposed, which entail a number of safety hazards.

The standard shall describe the necessary steps, conditions and protocols for the safe repair, reuse and repurpose of batteries and battery packs, modules and cells originally designed for electro-mobility applications.

It shall describe the quality control and safety requirements for the examination, sorting, performance testing, disposal, packing and shipment of batteries and battery packs, modules and cells that were originally manufactured and placed on the market for electro-mobility applications, and that are intended for reuse or repurpose in another application, such as for use in energy storage systems or other applications.

Relevant existing international standards and recommended practices include:

- ANSI/CAN/UL 1974, Evaluation for repurposing batteries
- IEC 62619:2017 Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium cells and batteries, for use in industrial applications.

- SAE J2950, SAE J2997 Standards for Battery Secondary Use
- IEC TR 61438:1996 Possible safety and health hazards in the use of alkaline secondary cells and batteries Guide to equipment manufacturers and users

# 2.4 Standard on the safety of Stationary Battery Energy Storage Systems with internal storage listed in point 4 of Table 1 of Annex I

The safety of passenger and commercial vehicles, including batteries, is already covered by a number of United Nations Global Technical Regulations, which have been enacted into EU law. For energy storage system, some safety standards exist at international level (IEC 62619) and in some member States (VDE 2510-50 in Germany), but there are no regulations at EU level.

The standard shall describe the necessary steps and conditions to test, at least, the following aspects related to the safe operation of stationary battery energy storage systems, with proper considerations to the risk of gases emitted from non-aqueous electrolytes:

- vibration
- thermal shock and cycling
- external short circuit protection
- overcharge protection
- over-discharge protection
- over-temperature protection
- overcurrent protection
- thermal propagation
- drop
- impact
- internal short circuit and
- thermal abuse.

Standardisation work should result in a set of operational instructions and conditions to increase the safety of battery packs/modules/cells originally designed for stationary use, as well as for the operation of repurposed battery packs/modules/cells in stationary applications that were originally designed for electro-mobility applications.

Relevant existing international and European standards and recommended practices include:

- ANSI/CAN/UL 1974, Evaluation for repurposing batteries
- ISO 18243:2017 (EN ISO 18243:2019) Electrically propelled mopeds and motorcycles Test specifications and safety requirements for lithium-ion battery systems
- EN 50604-1:2016 Secondary lithium batteries for light EV (electric vehicle) applications Part 1: General safety requirements and test methods
- IEC TS 62840-2:2016 (EN IEC 62840-2:2019) Electric vehicle battery swap system Part 1: safety requirements

- ISO 13063:2012 Electrically propelled mopeds and motorcycles Safety specifications
- IEC 62619:2017 (prEN IEC 62619:2020) Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium cells and batteries, for use in industrial applications.
- EN 50272-3:2002 Safety requirements for secondary batteries installations. Part 3: traction batteries
- ISO 6469-1:2019 -Electrically propelled road vehicles Safety specifications Part 1: On-board rechargeable energy storage system (RESS)
- IEC 61982-4:2015 (EN 61982-4:2016) Secondary batteries (except lithium) for the propulsion of electric road vehicles Safety requirements of nickel-metal hydride batteries
- IEC 62660-2:2018 (EN IEC 62660-2:2019) Secondary lithium-ion cells for the propulsion of electric road vehicles Part 2: Reliability and abuse testing
- IEC 62660-3:2016 (prEN IEC 62660-3) Secondary lithium-ion cells for the propulsion of electric road vehicles Part 3: Safety requirements
- SAE J2929: 2013 Safety Standard for Electric and Hybrid Vehicle Propulsion Battery Systems Utilizing Lithium-based Rechargeable Cells
- SAE J2464:2009 Electric and Hybrid Electric Vehicle Rechargeable Energy Storage System (RESS) Safety and Abuse Testing
- IEC 62485-1:2015 (EN IEC 62485-1:2018) Safety requirements for secondary batteries and battery installations Part 1: General safety information
- IEC 62485-2:2010 (EN IEC 62485-2:2018) Safety requirements for secondary batteries and battery installations Part 2: Stationary batteries
- IEC 62485-3:2014 (EN 62485-3:2014) Safety requirements for secondary batteries and battery installations Part 3: Traction batteries
- IEC 62485-4:2015 (EN IEC 62485-4:2018) Safety requirements for secondary batteries and battery installations Part 4: Valve-regulated lead-acid batteries for use in portable appliances
- prIEC 62485-5 ED1 (prEN 62485-5:2019) Safety requirements for secondary batteries and battery installations Part 5: Safe operation of stationary lithium-ion batteries
- prIEC 62485-6 ED1 (prEN 62485-6:2019) Safety requirements for secondary batteries and battery installations Part 6: Safe operation of lithium-ion batteries in traction applications
- IEC 63115-2:2020 (prEN IEC 63115-2:2019) Secondary cells and batteries containing alkaline or other non-acid electrolytes Sealed nickel-metal hydride rechargeable cells and modules for use in industrial applications Part 2: Safety
- IEC 63056:2020 (EN IEC 63056:2020) Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems

- IEC 62933-5-2:2020 (EN IEC 62933-5-2:2020) Electrical energy storage (EES) systems Part 5-2: Safety requirements for grid integrated EES systems electrochemical based systems
- IEC/TS 62933-5-1:2017 Electrical energy storage (EES) systems Part 5-1: Safety considerations for grid-integrated EES systems General specification
- IEC 63057:2020 (EN IEC 63057:2020) Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium batteries for use in road vehicles not for the propulsion
- IEC 62984-2:2020 (EN IEC 62984-2:2020) High-temperature secondary batteries Part 2: Safety requirements and tests
- IEC 62133-1:2017 (EN 62133-1:2017) -Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications Part 1: Nickel systems
- IEC 62133-2:2017 (EN 62133-2:2017/prA1:2020) Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications Part 2: Lithium systems