INTERNATIONAL STANDARD

ISO 6469-2

Third edition
2018-02

Electrically propelled road vehicles — Safety specifications —

Part 2: Vehicle operational safety

Véhicules routiers électriques — Spécifications de sécurité —

Partie 2: Sécurité fonctionelle du véhicule

Reference number
ISO 6469-2:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **iv**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Environmental and operating conditions **3**
5 Operational safety **3**
5.1 General 3
5.2 Driving-enabled mode 3
5.3 Driving 4
5.3.1 Indication of reduced propulsion power 4
5.3.2 Low energy content of RESS 4
5.3.3 Driving backwards 4
5.4 Parking 4
5.5 Connection of the vehicle to an external electric power supply 4
5.6 Electromagnetic compatibility 5
6 Owner's manual **5**
7 Information for first responders **5**
Bibliography **6**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 37, *Electrically propelled vehicles*.

This third edition cancels and replaces the second edition (ISO 6469-2:2009), which has been technically revised. The main changes compared to the previous edition are as follows:

— clarification of the single-point failure definition and related measures;

— improvement of the operational safety requirements for the driving-enabled mode;

— elimination of marking requirements;

— clear requirements for connection of the vehicle to an external electric power supply;

— simplification of EMC requirements.

Electrically propelled road vehicles — Safety specifications —

Part 2: Vehicle operational safety

1 Scope

This document specifies requirements for operational safety specific to electrically propelled road vehicles, for the protection of persons inside and outside the vehicle.

NOTE 1 Relevant requirements for motorcycles and mopeds are described in ISO 13063.

This document does not provide comprehensive safety information for manufacturing, maintenance and repair personnel.

This document does not consider specific aspects of driving automation features.

NOTE 2 For definition of the term "driving automation features", see SAE J3016.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11451 (all parts), *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
auxiliary electric system
vehicle system, other than for vehicle propulsion, that operates on electric energy

3.2
case A
connection of an *EV* (3.7) to the supply network with a plug and cable permanently attached to the EV

3.3
case B
connection of an *EV* (3.7) to the a.c. supply network with a cable assembly detachable at both ends

3.4
case C
connection of an *EV* (3.7) to the a.c. supply network utilizing a cable and vehicle connector permanently attached to the EV charging station

3.5
driving-enabled mode
operating mode in which the vehicle can be moved by its own propulsion system by one action

Note 1 to entry: Examples for this action are: pressure to the accelerator pedal, activation of an equivalent control, release of the brake system.

3.6
electric drive
combination of traction motor, power electronics and their associated controls for the conversion of electric to mechanical power and vice versa

3.7
electrically propelled vehicle
EV
vehicle with one or more *electric drive(s)* (3.6) for vehicle propulsion

3.8
fuel cell stack
assembly of two or more fuel cells that are electrically connected

3.9
fuel cell system
system, typically containing the following subsystems: *fuel cell stack* (3.8), air processing, fuel processing, thermal management, water management, and their control

3.10
fuel cell vehicle
FCV
electrically propelled vehicle (3.7) with a *fuel cell system* (3.9) as the power source for vehicle propulsion

Note 1 to entry: An FCV may also have a RESS or another power source for vehicle propulsion.

3.11
maximum working voltage
highest value of a.c. voltage (rms) or of d.c. voltage that can occur under any normal operating conditions according to the manufacturer's specifications, disregarding transients and ripples

3.12
propulsion system
combination of power source and powertrain for vehicle propulsion

3.13
rechargeable energy storage system
RESS
rechargeable system that stores energy for delivery of electric energy for *the electric drive* (3.6)

EXAMPLE Batteries, capacitors.

3.14
vehicle connector
part of a *vehicle coupler* (3.15) integral with or intended to be attached to the cable assembly

3.15
vehicle coupler
means of enabling the manual connection of a flexible cable to an *EV* (3.7) for the purpose of supplying electric energy to an *EV* (3.7)

Note 1 to entry: It consists of two parts: a vehicle connector and a vehicle inlet.

3.16
vehicle inlet
part of a *vehicle coupler* (3.15) incorporated in, or fixed to, an *EV* (3.7)

3.17
vehicle power supply circuit
voltage class B (3.18) electric circuit which includes all parts that are galvanically connected to the *vehicle inlet* (3.16) [*case B* (3.3), *case C* (3.4)] or the plug [*case A* (3.2)] and that is operational when connected to an external electric power supply

3.18
voltage class B
classification of an electric component or circuit with a *maximum working voltage* (3.11) of (>30 and ≤1 000) V a.c. (rms), or (>60 and ≤1 500) V d.c., respectively

Note 1 to entry: For more details, see ISO 6469-3.

3.19
single-point failure
system failure caused by the failure of only one of its constituent items

4 Environmental and operating conditions

The requirements given in this document shall be met across the range of environmental and operating conditions for which the electrically propelled vehicle is designed to operate, as specified by the vehicle manufacturer.

NOTE See ISO 16750, ISO/PAS 19295 and ISO 19453 (all parts) (under development) for guidance.

5 Operational safety

5.1 General

Measures shall be implemented to manage credible single-point failures specific to electrically propelled vehicles.

Examples for measures that address single-point failures are:

— normally open switches;

— normally closed fuel valves.

5.2 Driving-enabled mode

Movement of the vehicle by its propulsion system shall be possible only in the driving-enabled mode.

To switch the propulsion system from shut-off condition to driving-enabled mode, at least two deliberate and distinctive actions shall be necessary.

For reactivation of the propulsion system after its automatic or manual shut-off, the requirements for activating the driving enabled mode shall apply.

The vehicle shall indicate to the driver that the propulsion system is in driving enabled mode.

A main switch function and its actuation are required to activate and to deactivate the propulsion system. It shall be designed according to 5.1.

If FCVs are deactivated by a main switch function, the fuel-cell system may remain active to perform certain functions as required by the system.

If the vehicle is not in the driving-enabled mode, the power sources of the propulsion system (e.g. fuel cell system, RESS) may be active.

5.3 Driving

5.3.1 Indication of reduced propulsion power

If the electric propulsion system is equipped with a means to automatically reduce the vehicle propulsion power, it is recommended to indicate significant reductions to the driver.

NOTE Such means can limit the effects of a fault in the propulsion system or of an excessive power demand by the driver.

5.3.2 Low energy content of RESS

If a low state of charge (SOC) in the RESS has a relevant impact on the vehicle driving performance, a low energy content of the RESS shall be indicated to the driver (e.g. a visual or audible signal). At the first indication of the low state of charge specified by the vehicle manufacturer, the vehicle shall meet the following requirements.

a) The vehicle shall be capable of being driven out of the traffic area using its own propulsion system.

b) A minimum energy reserve shall still be available for the lighting system, when there is no independent energy storage for the auxiliary electric systems.

5.3.3 Driving backwards

If driving backwards is achieved by reversing the rotational direction of the electric motor, the following requirements shall be met to prevent unintentional switching into reverse when the vehicle is in motion:

To switch between the forward and backward (reverse) directions, either:

— two separate actions by the driver shall be required; or

— if only one driver action is required, a safety device shall allow the transition only when the vehicle is stationary or moving slowly, as specified by the manufacturer.

The vehicle shall indicate the selected drive direction to the driver.

5.4 Parking

When the driver is leaving the vehicle, it shall be indicated whether the electric propulsion system is still in the driving-enabled mode.

5.5 Connection of the vehicle to an external electric power supply

Vehicle movement by its own propulsion system shall be disabled when the vehicle power supply circuit is physically connected to the socket-outlet (case A) or the vehicle connector (case B and case C).

NOTE Explanatory figures for case A, case B and case C are given in IEC 61851-1.

The requirement is deemed to be fulfilled if the vehicle is designed such that a physically connected plug obviously prevents the operation of the vehicle controls for propulsion.

5.6 Electromagnetic compatibility

All electric and electronic functions of electrically propelled vehicles, which can affect safe operation of the vehicle, shall be functionally tolerant of the electromagnetic environment to which the vehicle will normally be exposed. This includes fluctuating voltage and load conditions, and electric transients.

The vehicle shall be tested according to the appropriate parts of the ISO 11451 series.

6 Owner's manual

Special attention to safety aspects specific to an electrically propelled vehicle shall be given in the owner's manual.

7 Information for first responders

The vehicle manufacturer shall provide special information for handling and safety of an electrically propelled vehicle after an accident for first responders and emergency services by appropriate documentation.

NOTE For example, guidance on emergency response is given in ISO 17840, SAE J2578 and SAE J2990.