SLOVENSKI STANDARD
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Electrically propelled road vehicles - Specific requirements for safety - Part 2: Functional safety means and protection against failures

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Elektrisch angetriebene Straßenfahrzeuge - Besondere Festlegungen für die Sicherheit - Teil 2: Funktionelle Sicherheitsvorkehrungen und Schutz gegen Fehler

Véhicules routiers a propulsion électrique - Prescriptions particulieres pour la sécurité - Partie 2: Mesures de sécurité fonctionnelle et protection contre les défaillances

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 301 "Electrically propelled road vehicles", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1997, and conflicting national standards shall be withdrawn at the latest by December 1997.

EN 1987 consists of the following parts, under the general title "Electrically propelled road vehicles - Specific prescriptions for safety" :

- Part 1: On board energy storage;

- Part 2: Functional safety means and protection against failure;

- Part 3: Protection of users against electrical hazards.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European standard specifies all requirements specific to the electrically propelled vehicles in order to remain safe both for the users of the vehicle and for the environment of the vehicle (pedestrian, nature protection against pollution etc.). This standard does not apply to maintenance operations and specific requirement for the vehicle connected to an external power supply.

This part deals with functional safety means and protection against failures, thus defining the minimum rules to follow in the design of the electric vehicle and the specific hazards to avoid due to the electrical drive aspects of the vehicle.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 11451, Road vehicles - Electrical disturbances by narrowband radiated electromagnetic energy - Vehicle test methods.

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 Drive system

The drive system includes all electric traction motors and the power control units for these motors ; not the on-board electric power source, e.g. the traction battery, and not auxiliary electronic devices and converters, e.g. DC/DC/-converter, on-board charger (unless it is common with the inverter/motor controller).

3.2 Drive direction control

The drive direction control is a specific device physically actuated by the driver in order to select the drive direction of the vehicle (forwards or backwards). Examples are lever or push-button switch.

3.3 Auxiliary functions

The auxiliary functions are those which are common between internal combustion engine and electric vehicles, for instance lighting.

3.4 Auxiliary network

The auxiliary network is the electrical circuit of lower working voltage than power circuit, supplying the auxiliary functions of the vehicle (lighting, warning, windscreen motor, etc.), and its nominal voltage is usually 12 V or 24 V.

4 General and environmental conditions

As installed in the vehicle, the components specific for an electric road vehicle shall be designed and constructed so as to operate under the same conditions, for which the whole vehicle is designed.

5 Operational safety

5.1 Power on procedure

The power on procedure is applied via the key-switch with a minimum of two key positions:

- Position 1: "Off"

Drive system off, no active driving possible. Only in this position the key can be inserted and removed;

- Position 2: "Operation"

Active driving possible after at least one additional voluntary action, e.g. a change in the drive mode switch from "neutral, park" to "drive" or "neutral, park" to"reverse" or a third key position. In the latter case, no unintentional movement of the vehicle shall occur.

Power on or moving by its own drive system shall not be possible when the vehicle is physically connected to an external electric network (e.g. mains, off-board charger).

Exception : specially designed connecting devices for automatic operation.

After an automatic or manual turn-off of the drive system, it shall only be possible to reactivate it by normal power on procedure.

An obvious device shall indicate permanently or temporarily, that the drive system is in the mode "active driving possible".

5.2 Driving

5.2.1 Indication of reduced power

If drive power is automatically reduced significantly (e.g. by high temperature of drive system or power source components), this shall be indicated by an obvious device.

5.2.2 Indication of low state of charge level of the traction battery

The low state of charge level of the traction battery shall be indicated by an obvious device, e.g. state-of-charge meter. Level to be decided by manufacturers, but shall satisfy special safety requirements, e.g:

- it shall be possible to move out of the traffic area using the drive system;

- a minimum energy reserve for the safety lighting system, in accordance with current regulations, shall be provided, if the traction battery is the direct power source for the auxiliary electrical network.

5.3 Driving backwards

If driving backwards is achieved by reversing the rotational direction of the electric motor, the following specifications shall be met:

a) the state of the drive direction control shall be identifiable;

b) the capital letter "R" shall identify reverse mode;

c) to avoid the danger of unintentionally switching to reverse when the vehicle is moving, the actuation of the drive direction control shall require:

1) either the combination of two different, consecutive movements,

2) or a safety device which allows reverse to be engaged only when the vehicle is stationary or moving at a slow speed, in which case actuation of the drive direction control shall be indicated obviously.

The maximum reverse speed shall be limited (speed limit left to manufacturer's decision).

If driving backwards is not achieved by reversing the rotational direction of the electric motor, the current regulations on vehicles with internal combustion engine apply on the electric vehicle.

5.4 Parking

When leaving the vehicle, the driver shall be informed by an obvious signal (e.g. acoustic or optical signal) if the drive system is still in the mode "active driving possible".

If the traction motor continues to turn in a stationary vehicle, the user's manual shall point out, that the vehicle is liable to move if a gear is engaged.

5.5 Master switch

A master switch shall make it possible to disconnect at least one pole of the electric power source (e.g. traction battery) from the drive system at any time.

The master switch shall be activated (on and off) by a manual device within reach of the driver's hand (e.g. key-switch). Additional disconnection via an electronic safety device is possible.

After each disconnection, it shall only be possible to reactivate the drive system by the power on procedure (see 5.1).

5.6 Electromagnetic susceptibility

The electric vehicle shall be tested in accordance with ISO 11451. The field strength reference level shall be 30 V/m r.m.s [1].

5.7 Auxiliary function

During operation of the electric vehicle, all auxiliary functions shall meet the requirements of relevant EU-Directives, in particular lighting, signalling and safety functions.

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[1] r.m.s = root mean square.