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Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 5: Automated conductive power transfer

~~DTS stage~~

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~~***A model manuscript of a draft International Standard (known as "The Rice Model") is available at***~~

ISO copyright office

CP 401 • Ch. de Blandonnet 8

CH-1214 Vernier, Geneva

Phone: +41 22 749 01 11

Fax: +41 22 749 09 47

Email: copyright@iso.org

Website: www.iso.orgwww.iso.org

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Foreword

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

A list of all parts in the ISO 5474 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document specifies requirements for the onboard side of an automated connection system to charge electric vehicles. It gives guidance in terms of safety and compatibility with offboard sides.

Technological maturity:

It is pointed out, ~~that~~ this document has been established in parallel to the technological development of automated connection systems. Due to the fact~~,~~ that the experience with the technology is very limited, the requirements given in this document do not comprehensively cover all aspects/requirements for an interoperable operation at this stage. Current and future product developments will continuously prove, disprove and refine the requirements of this document.

Furthermore, it is worthwhile to mention~~,~~ that at the date of publication of this document no standard for a vehicle coupler of category 3 (at the underbody of the vehicle) is available.

Relation to other parts of ISO 5474-series

There is no direct relation of content or structure of this document to any other part of the ISO 5474-series (including part 1). Wherever needed, other parts of the series are specifically referenced.

Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 5: Automated conductive power transfer

1 Scope

This document defines requirements for automated connection for conductive alternative current (AC) and/or direct current (DC) power transfer between electrically propelled road vehicles (EVs) and external electric circuits. This document addresses the following aspects of the ~~ACD~~automated connection device (ACD) onboard subsystem:

— electrical and mechanical safety requirements;

— interoperability requirements;

— environmental conditions;

— vehicle position requirements;

— requirements for localization of vehicle coupler (case D), and plug and socket-outlet (case E) location requirements of onboard part of the automated vehicle coupler;

— functionality requirements;

— test procedures.

This document applies to:

— EVs supporting automated connection of a vehicle inlet (case D) according to IEC 62196-2, IEC 62196-3, IEC TS 62196-3-1 or IEC TS 63379 (category 1) and

— EVs supporting automated connection of a vehicle inlet (case D) or plug (case E) of category 3 (typically at the underbody of the vehicle). This does not include automated connection of vehicle inlets or plugs of category 1 and category 2, that can also be mounted at the underbody of the vehicle.

Requirements for EVs equipped with an ACD or ACD counterpart of category 2 are specified in EN 50696.

Requirements for simultaneous operation of multiple power transfer interfaces is under consideration and not covered in this ~~edition~~document.

NOTE 1 Requirements for ACD infrastructure, communication sequence and communication interface are specified in IEC 61851-23-1, IEC TS 61851-26 and IEC TS 61851-27.

~~NOTE 2 IEC 63407 will potentially replace EN 50696.~~

~~NOTE 3~~NOTE 2 EMC requirements for vehicles conductively connected to the supply network are defined in IEC 61851-21-1.

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 5474-1, [1], *Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 1: General requirements for conductive power transfer*

ISO 5474-2, [2], *Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 2: AC power transfer*

ISO 5474-3, [3], *Electrically propelled road vehicles — Functional requirements and safety requirements for power transfer — Part 3: DC power transfer*

~~IEC/TS 61851-26, [4], *Electric vehicle conductive charging system — Part 26: EV supply equipment with automated connection of a vehicle coupler located at the underbody of an electric vehicle*~~

~~IEC/TS 61851-27, [5], *Electric vehicle conductive charging system — Part 27: EV supply equipment with automated connection of a vehicle coupler according to IEC 62196-2 or IEC 62196-3*~~

53 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5474-1 and the following apply.

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

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

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

3.1
ACD control communication
communication session established between the *automated connection device (ACD)* (3.6) offboard subsystem and onboard subsystem, used for coupler positioning control

3.2
ACD ground clearance
vertical distance between the ground surface and the lowest point of the onboard ~~ACD sub-system~~*automated connection device (ACD)* (3.6) subsystem including the housing.

Note 1 to entry: The lower surface does not need to be planar or parallel to the ground surface.

3.3
ACD offboard subsystem

[1] ~~First edition under~~Under preparation. Stage at the time of publication: ISO/DIS 5474-1:~~2022~~2023.
[2] ~~First edition under~~Under preparation. Stage at the time of publication: ISO/DIS 5474-2:~~2022~~2023.
[3] ~~First edition under~~Under preparation. Stage at the time of publication: ISO/DIS 5474-3:~~2022~~2023.
~~[4] First edition under preparation. Stage at the time of publication: IEC TS/CD 61851-26:2022.~~
~~[5] First edition under preparation. Stage at the time of publication: IEC TS/CD 61851-27:2022.~~

device installed in the *automated connection device (ACD)* (3.6) station and used in combination with an *ACD onboard subsystem* (3.4) to make and break the physical connection between an electrical vehicle (EV) supply equipment and the vehicle

3.4
ACD onboard subsystem
device installed in a vehicle and used in combination with an *automated connection device (ACD)* (3.6) offboard subsystem to automatically make and break the physical connection between an electric vehicle (EV) supply equipment and the vehicle

Note 1 to entry: An ACD onboard subsystem can feature movable parts for mating support in addition to the *manipulator* (3.13) of the ACD.

Note 2 to entry: An ACD onboard subsystem can feature mechanical means for locking and unlocking the ACD.

3.5
ACD station
electric vehicle (EV) supply equipment with automatic charging function

3.6
ACD
automated connection device
~~**ACD**~~
active device where the physical connection between an electric vehicle (EV) supply equipment and vehicle is made without user interaction providing an electromechanical interface

[SOURCE: IEC 61851-23-1:—[6], 3.1.203]

3.7
case D
connection of an electric vehicle (EV) to an EV supply equipment utilizing a *manipulator* (3.13) permanently attached to the EV supply equipment

Note 1 to entry: ~~Manipulator~~A manipulator can be:

— ground (in-ground or on-ground) mounted;

— wall mounted;

— above-roof mounted.

Note 2 to entry: ~~Vehicle~~A vehicle connector is operated by the manipulator, ~~Vehicle~~the vehicle inlet is permanently attached to the EV.

Note 3 to entry: The cable assembly is part of the EV supply equipment and integral part of the manipulator.

3.8
case E
connection of an electric vehicle (EV) to an EV supply equipment utilizing a *manipulator* (3.13) permanently attached to the EV

Note 1 to entry: ~~Manipulator~~A manipulator can be:

[6] Under preparation. Stage at the time of publication: IEC/CDV 61851-23-1:2023.

— under-body mounted;

— side (front, rear or side) mounted;

— on/in-roof mounted.

Note 2 to entry: ~~Vehicle~~A vehicle inlet is operated by the manipulator, the vehicle connector is permanently attached to the EV supply equipment.

Note 3 to entry: The cable assembly is part of the EV and integral part of the manipulator.

3.9
charging communication
communication session established between the *supply equipment communication controller (SECC)* (3.17) and the *electric vehicle communication controller (EVCC~~,~~)* (3.11), used for charging control

3.10
clearance space
space that is kept free of obstacles

Note 1 to entry: In IEC 62196-2~~:2022~~ this space is called packaging room.

Note 2 to entry: In this document this term is used to specify the space around the vehicle inlet ~~{Case~~[*case D*~~}~~ (3.7)] or socket outlet ~~{~~[*case E*~~}~~, (3.8)], where no obstacles are allowed.

3.11
EVCC
EV communication controller
~~**EVCC**~~
embedded system, within the electric vehicle (EV~~,~~), that implements the communication between the ~~EVCC~~EV and the *supply equipment communication controller (SECC)* (3.17) in order to support specific functions

Note 1 to entry: Such specific functions could be, e.g. controlling input and output channels, encryption, or data transfer between ~~EVCC~~EV and SECC.

[SOURCE: ISO 15118-1:~~2018~~2019, 3.1.31, modified — "vehicle" was replaced by "~~EV" and by "EVCC" in the second occurrence and in Note 1 to entry.~~]electric vehicle".]

3.12
immobilization
inhibition of vehicle movement by its own propulsion system

3.13
manipulator
mechanism consisting of an arrangement of segments, jointed or sliding relative to one another

[SOURCE: ISO 8373:2021, 4.14, modified — Notes to entry deleted.]

3.14
mating space
spatial envelope of points where mating of the vehicle coupler is possible

3.15
operating space
space which can be swept by the *manipulator*~~,~~ (3.13), plus the space which can be swept by the connector or plug

Note 1 to entry: This space can be restricted by limiting devices that establish limits which will not be exceeded.

3.16
P2PS
point to point signal
~~P2PS~~unidirectional wireless link between the electric vehicle (EV) and EV supply equipment

Note 1 to entry: The P2PS is used for signalling in the context of positioning or pairing functionalities.

[SOURCE: ISO 61980-2:2021, 3.17, modified — "EV device" changed to "EV", "supply device" changed to "EV supply equipment" and Note 1 to entry added.]

3.17
supply equipment communication controller
SECC
entity which implements the communication to one or multiple ~~EVCC(s)~~ *electric vehicle communication controller(s) (EVCC (s))* (3.11)

Note 1 to entry: Further details regarding possible architectures are given in ~~Annex A of~~ ISO 15118-1:2019~~.~~, Annex A.

Note 2 to entry: Functions of a supply equipment communication controller may control input and output channels, data encryption, or data transfer between the EVCC and SECC.

[SOURCE: ISO 15118-1:2019, 3.1.68, modified — "and which may be able to interact with secondary actors" is deleted, Note 1 to entry is deleted and in Note 3 to entry "vehicle" is replaced by "EVCC".]

~~6~~4 System architecture

~~6.1~~4.1 General

To establish a general baseline for the requirements defined in this document and in IEC TS 61851-26 and IEC TS 61581-27, the automatic charging system is structured into functional entities. Figure 1 shows an example of the system architecture including a structure of functional entities.

NOTE Figure 1 is not meant to give an indication on hardware packaging.