SLOVENSKI STANDARD
oSIST prEN IEC 63407:2025

01-februar-2025

Konduktivno polnjenje električnih vozil - Kontaktni vmesnik za avtomatsko priključno napravo (ACD)

Conductive charging of electric vehicles - Contact interface for automated connection device (ACD)

Charge conductive des véhicules électriques - Interface de contact pour les dispositifs de connexion automatisés (ACD)

Ta slovenski standard je istoveten z: **prEN IEC 63407:2024**

ICS:

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43.120	Električna cestna vozila	Electric road vehicles

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23H/561/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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IEC SC 23H : PLUGS, SOCKET-OUTLETS AND COUPLERS FOR INDUSTRIAL AND SIMILAR APPLICATIONS, AND FOR ELECTRIC VEHICLES	
SECRETARIAT: France	SECRETARY: Mrs Anne Le Guennec
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 69	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Electricity transmission and distribution,Energy Efficiency,Safety	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING
Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	

This document is still under study and subject to change. It should not be used for reference purposes.

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TITLE:

Conductive charging of electric vehicles - Contact interface for automated connection device (ACD)

PROPOSED STABILITY DATE: 2030

NOTE FROM TC/SC OFFICERS:

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Inhalt

Introduction

The electrical interface for charging electrically propelled vehicles with plugs, socket-outlets, vehicle connectors and vehicle inlets is described in IEC 62196 series and IEC 61851-23. For heavier vehicles such as buses and trucks, requirements of short charging times with high energy present a problem of handling, and safety with hand-held connecting devices. For these high current charging applications, an automated connection device (ACD) is of interest.

An automatic coupler consists out of a mobile assembly with electrical contacts, called ACD and fixed electrical contacts, called ACD counterpart. Automatic couplers allow an unmanned connection of high-current contacts and signal/control contacts.

This document contains requirements for all type of ACDs. Its annexes describe specific implementations and specific requirements. This document is expected to be read in conjunction with IEC 61851-23-1:—[1].

[1] Under preparation. Stage at time of publication: IEC CDV 61851-23-1:2020.

1 Scope

This document is applicable to automatic couplers of standardized configuration, intended for use in electric vehicle conductive charging systems which incorporate control means, with rated operating voltage up to 1 500 V DC.

This document applies to high power DC interfaces intended for use in isolated conductive charging systems, for circuits specified in IEC 61851-23-1:—[1].

The requirements of this standard applies only to automatic couplers defined in the annexes A, B, C and D of this document.

The ACDs covered by this document are used only in charging mode 4, according to IEC 61851-23-1:—[1], 3.1.201 Case D or 3.1.202 Case E.

This document describes the requirements for an automatic couplers in regard of safety, function and testing. This document describes basic parameters that can be standardized for different automatic couplers s. Automatic couplers s following these standardized parameters will have the benefit of being compatible, even if they are based on different technologies.

This document does not apply to solutions based on a vehicle connector described in IEC 62196-3 and IEC TS63379 driven by an automatic mechanism, as, for instance, a robotic arm.

This document does not apply to systems described in IEC 61851-26.

This document does not cover all safety aspects related to maintenance.

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.

EN 1652, *Copper and copper alloys - Plate, sheet, strip and circles for general purposes*

EN 12163, *Copper and copper alloys - Rod for general purposes*

EN 12167, *Copper and copper alloys - Profiles and bars for general purposes*

IEC 60068-2-11, *Environmental testing - Part 2: Tests - Test Ka: Salt mist*

IEC 60204-1: 2016, Safety of machinery – Electrical equipment of machines – Part 1: General requirements

IEC 60309-1, *Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 1: General requirements*

IEC 60512-2-2, *Connectors for electronic equipment - Tests and measurements – Part 2-2: Electrical continuity and contact resistance tests - Test 2b: Contact resistance – Specified test current method*

IEC 60512-5-1, *Connectors for electronic equipment - Tests and measurements - Part 5-1: Current-carrying capacity tests - Test 5a: Temperature rise (IEC 60512-5-1)*

IEC 60512-5-2, *Connectors for electronic equipment - Tests and measurements - Part 5-2: Current-carrying capacity tests - Test 5b: Current-temperature derating (IEC 60512-5-2)*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61851-1:2019, *Electric vehicle conductive charging system - Part 1: General requirements*

IEC 61984:2008, *Connectors - Safety requirements and tests*

IEC 61851-23-1:—,[2] *Electric vehicle conductive charging system – Part 23-1: DC charging with an automatic connection system*

IEC 62196-1:2014, *Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements*

IEC 62497-1, *Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment*

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

IEC 62477-1:2016, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

IEC TS 63379, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – conductive charging of electric vehicles - Vehicle connector, vehicle inlet and cable assembly for Megawatt DC charging*—[2]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61851-23-1:—[1] and the following 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 working position

position reached when the ACD and the fixed ACD counterpart have mated and when the physical contact is established, and energy transfer is allowed

3.2 home position

position where the ACD is not engaged with its counterpart and where safe clearance is present with street and infrastructure

3.3 keep-out zone

Space around automatic coupler, where no items shall be installed to avoid collision with any moving part of the ACD or ACD counterpart.

4 Electrical requirements

4.1 Voltage and current requirements

4.1.1 Number of contacts

For systems described in IEC 61851-23-1:—[1], Annexes AA, BB and CC:

Four contacts: DC+, DC-, PE and CP (IEC 61851-23-1:—[1], Figure AA.1, IEC 61851-23-1:—[1], Figure BB.1 and IEC 61851-23-1:—[1], Figure CC.14)

For systems described in IEC 61851-23-1:—[1], Annex KK:

three contacts: DC+, DC-, PE (IEC 61851-23-1:—[1], Figure KK.14)

[1] Under preparation. Stage at time of publication: IEC CDV 61851-23-1:2020.
[2] Under preparation.

4.1.2 Quality of DC charging voltage

Since the ACD is part of the power transmitting system, its influence on the quality of DC charging voltage shall be considered, to not exceed the levels indicated in IEC 61851-23-1: Chapter 101.1.2 —[1].

4.1.3 Rated continuous current

The rated current can be a continuous current or the average of an intermittent current.

The rated current is defined by the vehicle and the application. The manufacturer of the ACD shall guarantee that his system is sized and safe for this current by confirming the physical values described in this document.

In the case of an automatic coupler consisting of an ACD and an ACD counterpart from different or unknown manufacturers, the minimum current requirements that fulfil the requirements for a particular annex of this document shall be assumed unless there are sensing devices that can reliably determine if the ACD is operating within the defined limits of this document. However, if the ACD and the ACD counterpart can be definitively determined to be of a particular type and manufacturer, higher currents with or without sensing devices can be used, according to manufacturer's specifications.

4.1.4 Short-circuit current

In case of short circuit, the ACD shall not cause dangerous situation such as an explosion or a fire. After such a short circuit, the ACD shall be checked for proper function prior further service. The procedure for checking proper function shall be part of the maintenance manual.

For the values of short circuit current please reference to IEC 61851-23-1 chapter 13.101 (69/943/NP).

For the actual values of short circuit current please refer to IEC61851-23-1 chapter 13.101.

4.1.5 Maximum temperature of contacts

The contacts of the automatic coupler have a temperature rise depending on the charging current (rated continuous current or intermitted current). This temperature rise shall be considered by the system integrator, so that it has no damaging influence on materials or devices in the surrounding of the automatic coupler at vehicle side and infrastructure side.

The ACD manufacturer shall indicate this maximum temperature rise for a rated current and the ambient temperature at which it is reached in their documentation.

1 IEC 61851-23-1 under development, all references are to IEC 69/943/NP version.

Compliance is checked by test in Clause 8, Table 3.

4.2 Signals

The minimum signals required are the status (the position) of the ACD. All other signalling necessary for pairing or charging are described in IEC 61851-23-1:—[1] or in ISO 15118.

Signal 1: ACD is in home position.

Signal 2: ACD has reached working position (see annexes for specific implementation).

The home position signal is a "safety-related part of a control system (SRP/CS)" in regard of ISO 13849-1; chapter 3.1.1.

NOTE: There may be a timeout if ACD is moved but the working position has not been reached in a specific time frame. This time frame has to be defined by the ACD manufacturer. This time out functionally is described in IEC 61851-23-1:—.

5 Safety requirements

Relevant safety requirements in regard of the system are given by the IEC 61851-23-1.

5.1 Malfunction by contaminants

In case of blocking contaminants, the ACD might not reach the home position. There shall be an installed system that monitors the ACD to reach the home position (see 4.2). This shall be realized by the ACD itself and communicated to the overall system (EV or EVSE).

NOTE: For reaction of this missing home position signal, refer to IEC 61851-23-1:—[1], CC.5.201, KK.5.201 or ISO 5474-:7.6.5.

5.2 Contact sequence

According to IEC 61851-23-1:—[1], the connection and disconnection of the ACD shall be done without current under normal operation. It is not necessary to have a contact sequence. But if a contact sequence is applied, the order of disconnection shall be one of:

– CP contact,
– DC power contacts,
– PE contact.

Or

– PE contact,
– DC power contacts,
– CP contact.

Or

– CP and PE contacts,
– DC power contacts.

The ACD shall be classified by the manufacturer as either suitable or not suitable to break under load depending on whether or not breaking under load is possible under normal operation.

Compliance is checked by test in clause 8.1 breaking capacity.

NOTE: Under fault emergency disconnection situation during power transfer without a first disconnecting CP or PE, arcing cannot be avoided. It is recommended to have a first disconnecting CP/PE or a guaranteed arc resistive system, so that no danger situation due to that arc can occur (i. e.. fire). Scope is safety and not contact degradation.

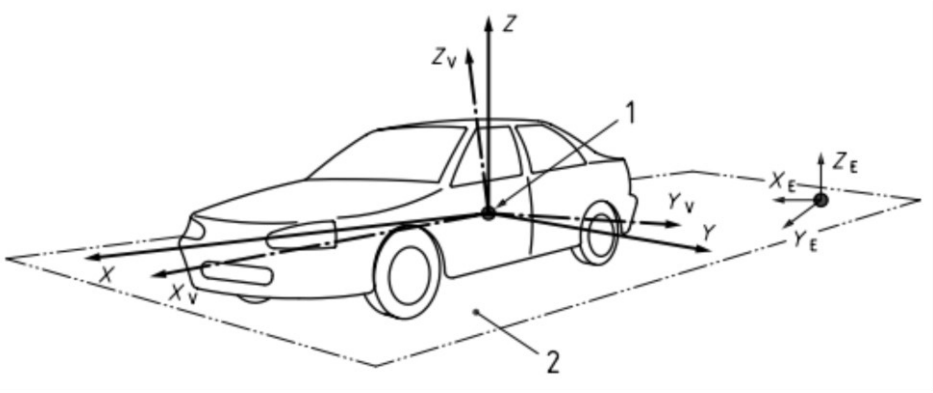
5.3 Return to home position

In case of an intentional or unintentional loss of supply power for the actuator of the ACD, the ACD shall return to its home position. For details refer to IEC 61851-23-1:—[1], Clause 201.3 “Loss of power”

Compliance is checked by test in Clause 8, Table 1 *Test Number B3.*

6 Mechanical requirements

6.1 Grid of parallels and meridians



Key

No	Part
1	Reference point – axle A as explained in 6.2
2	Ground level

Figure 1 — Grid of parallels and meridians according ISO 8855

6.2 Specific mechanical requirements for busses

Distinction shall be made with regards to the several vehicle dimensions, for instance double/single deck buses, resulting in several distances between the ACD and the ACD counterpart.

The centre of the nominal working position of the automatic coupler is over the axle A of the electrical vehicle and the centre line from front to back.

The system integrator shall ensure the correct position of the ACD or ACD counterpart on the electric vehicle and infrastructure.

NOTE: The position of the ACD or ACD counterpart on the EV depends on e.g. the installation height on the EV, the installation height in the infrastructure, the curve of horizontal displacement over the working height of the ACD system and vehicle height. Care should be taken to interoperability of different EVs and infrastructure situations.

Axle A is defined as the first front axle in regard of the driving direction of the vehicle.

This is the reference point for the parking tolerances during charging: x-centre, y-centre, z-centre of axle A

6.3 Tolerances of parking position

6.3.1 General

Figure 2 shows the location of contact systems and positioning tolerances.