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Kontaktni vmesnik za avtomatizirane priključne naprave

Contact Interface for Automated Connection Device

Kontaktschnittstelle für ein automatisches Kontaktierungssystem

Interface de contact pour les dispositifs de connexion automatisés

Ta slovenski standard je istoveten z: **prEN 50696**

ICS:

43.040.10	Električna in elektronska oprema	Electrical and electronic equipment

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This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2020-04-17.

It has been drawn up by CLC/TC 23H.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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European Committee for Electrotechnical Standardization
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European foreword

This document (prEN 50696:2020) has been prepared by CLC/TC 23H, WG 5, "*Contact interface for automated connection devices (ACD)*".

This document is currently submitted to the Enquiry.

The following dates are proposed:

• latest date by which the existence of this document has to be announced at national level	(doa)	dor + 6 months
• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	dor + 12 months
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dor + 36 months (to be confirmed or modified when voting)

Introduction

The electrical interface for charging electrically propelled vehicles with plugs, socket-outlets, vehicle connectors and vehicle inlets is described in EN 62196 series and EN 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 automated coupler consists out of a mobile assembly with electrical contacts, called ACD and fixed electrical contacts, called ACD counterpart. Automated couplers allow an unmanned connection of high-current contacts and signal/control contacts.

The present document contains requirements for all type of ACDs. Its annexes describe specific implementations and specific requirements. This document have to be read in conjunction with prEN 61851-23-1:2018.

1 Scope

This document is applicable to ACDs 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 prEN 61851-23-1:2018.

The ACDs covered by this document are used only in charging mode 4, according to prEN 61851-23-1:2018, 3.1.201 Case D or 3.1.202 Case E.

This document describes the requirements for an ACD in regard of safety, function and testing. This document describes basic parameter that can be standardized for different ACDs. ACDs 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 EN 62196-3 driven by an automated mechanism, as f. i. a robotic arm.

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 50124-1:2001, *Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*

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

prEN 61851-23-1:2018,[1] *Electric vehicle conductive charging system – Part 23-1: DC charging with an automated connection system*

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

ISO 17409:2015, *Electrically propelled road vehicles — Connection to an external electric power supply — Safety requirements*

EN 61140:2016, *Protection against electric shock - Common aspects for installation and equipment*

EN 60664-1, *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests*

[1] Under preparation.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 61851-23-1:2018 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 above and around automated coupler

4 Electrical Requirements

4.1 Voltage and current requirements

4.1.1 Number of contacts

For systems described in prEN 61851-23-1:2018, Annex AA, BB and CC:

Four contacts: DC+, DC-, PE and CP (prEN 61851-23-1:2018 AA.11, prEN 61851-23-1:2018 BB.11 and prEN 61851-23-1:2018 CC.11)

For systems described in prEN 61851-23-1:2018 Annex KK:

three contacts: DC+, DC-, PE (prEN 61851-23-1:2018 KK.11)

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 to exceed the levels indicated in prEN 61851-23-1:2018.

4.1.3 Rated continuous current

The maximum current may exceed the limits defined in EN 62196-1. 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 standard.

In the case of an automated 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 standard. 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

The short-circuit current is specified in ISO 17409:2015, 6.2.4.2 for system C and shall be taken into consideration also for ACD charging. The short circuit current of the electric vehicle supply equipment (EVSE) is defined in prEN 61851-23-1:2018, Annex CC 6.5 and Annex KK 6.5

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.

NOTE 1: 12 000 000A^2s can be reached with 34 600 A in 10 ms or 11 000 A in 100 ms or 3 460 A in 1 s.

The ACD shall be designed in such a way that a peak current of 30 kA, considered in ISO 17409:2015, 6.2.4.2 shall not lead to damages or dangerous situations in regard of the Lorenz force.

NOTE 2 This limit is given in ISO 17409 and in prEN 61851-23-1:2018.

4.1.5 Maximum temperature of contacts

The contacts of the Automated coupler have a temperature rise depending on the charging current (rated continuous current or intermitted current). This temperature rise shall not have any damaging influence on materials or devices in the surrounding of the Automated coupler. These materials or devices require a maximum temperature of 90 °C according to ISO 17409.

Compliance is checked by test in chapter 8 Table 4.

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 prEN 61851-23-1:2018 or in ISO 15118.

ACD is in home position

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

The home position signal is safety relevant.

There shall be a timeout if ACD is moved but the working position has not been reached in a specific time frame. This information shall be verified by overall system electric vehicle (EV) EVSE, not by the ACD.

5 Safety requirements

5.1 EN 61140

In case of blocking contaminants, the ACD may not reach the home position. There shall be an installed system that monitors the ACD to reach the home position. 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 prEN 61851-23-1:2018, CC.4.201 or ISO 17409.

5.2 Contact sequence

According to prEN 61851-23-1:2018, the connection and disconnection of the ACD shall be done without current. It is not necessary to have a contact sequence because no dangerous voltage is present.

NOTE: Under emergency situation without a first disconnecting CP or PE, arcing cannot be avoided. it is suggested to have a first disconnecting CP/PE or a guaranteed arc resistive system, so that no danger situation due to that arc can occur (f. e. fire). Scope is safety and not abrasion.

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 prEN 61851-23-1:2018, Clause 103.3 “Loss of power”

Compliance is checked by test in chapter 8 Table 1 Test Number B3.

6 Mechanical Requirements

6.1 Grid of parallels and meridians

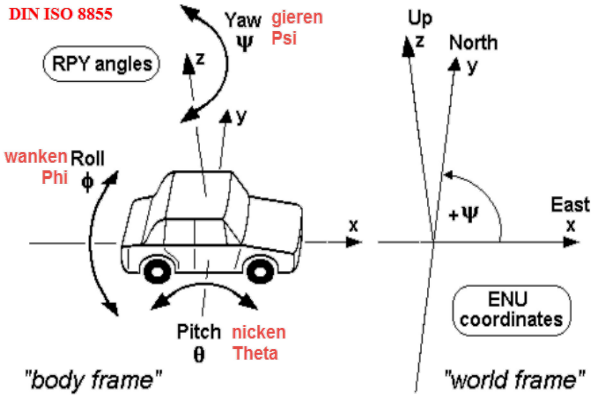

Figure 1 — Grid of parallels and meridians according ISO 8855

6.2 Specific Mechanical Requirements for Busses

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

For the position of ACD or the ACD counterpart on the vehicle the reference point is centred over axle A.

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

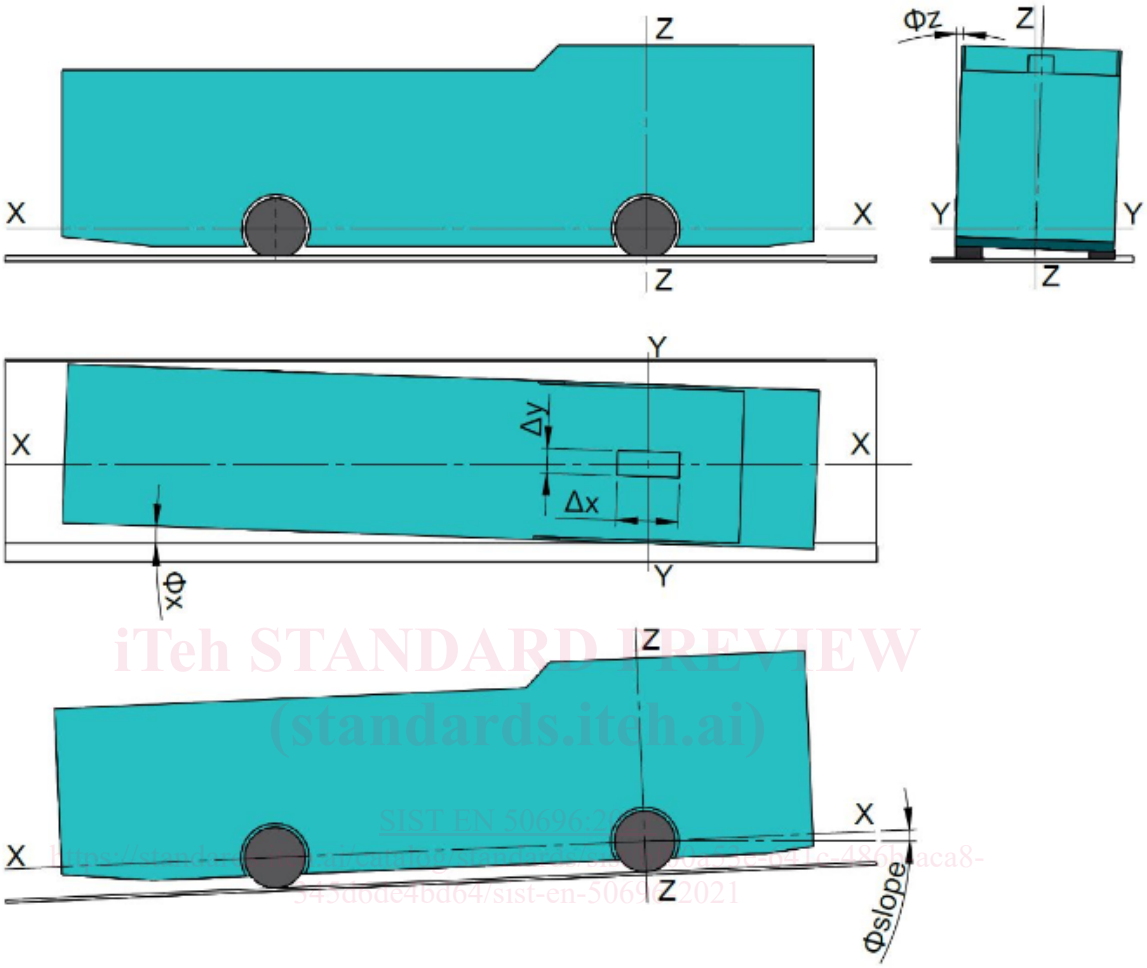

Figure 2 — Location of a Contact System and Positioning Tolerances

6.3.2 Minimum normative requirement for parking

The minimal positioning tolerances, that have to be compensated while positioning the vehicle for charging, are in x- and y- direction and for positioning angle between vehicle and curb:

X at least ± 200mm (Δx)

Y at least ± 200mm(Δy), Y at least 0 to +200mm for Annex C

Angle between vehicle and curb (Φx) up to +-2°

Being connected and the vehicle being immobilized, the ACD shall also deal with tolerances of the vehicle caused by dynamic movements due to kneeling, wind and passenger on and off, and has to avoid losing contact.

The minimum dynamic tolerance dY = 110mm for a 3.1m vehicle height and 2° kneeling (Φz)

The minimum dynamic tolerance dX = 70mm for back to front kneeling

The minimum dynamic tolerance dZ = +-70mm due to air suspension.

The minimum dynamic tolerance dZ = +0/ −87mm for 2500mm vehicle width due to 2° kneeling (Φz).

If any of above required tolerances are exceeded in service by incidence or accidence, no dangerous or damaging situation shall occur. This can be done by physical limits, as for instance, curbs or sensors detecting the right position.

NOTE 1: Kneeling is considered only to one side.

NOTE 2: Considering his requirements, the operator can require increased tolerance values if necessary.

NOTE 3: Besides public bus transports and specifically for autonomous vehicle or autonomous vehicle parking, e.g. automated driven bus depots, smaller tolerances can be agreed between contracting parties.

The physical dimensions of the ACD shall be considered for the dimensions of the vehicle and national or city regulations for minimum clearance in street traffic. A total load inclusive the force of the contact pressure shall be considered for the fixing points.

7 Environmental Requirements

7.1 Degree of pollution

ACD which are IPXXB when mated shall be designed for pollution degree 3 according to EN 60664-1.

ACD which are IP00 when mated shall be designed for pollution degree PD4 according to railway standard EN 50124-1.

For covered or cleaned contacts, the normative described reduction of the creepage and air gap distance can be used.

NOTE Special pollutions such as leaves, branches etc. can be present and require regular cleaning of the interface. The cleaning schedule of the automated coupler can be agreed between the operator and the manufacturer of the ACD as its operation is highly dependent on the rate of pollution.

7.2 Overvoltage category

The over voltage category for the ACD shall be equal or higher than required in prEN 61851-23-1:2018 and in ISO 17409.

According to prEN 61851-23-1:2018, Clause 12.7.101 Suppression of overvoltage (insulation coordination), the DC EV charging station shall reduce overvoltage between DC ± and protective conductor to 2 500 V.

NOTE This standard applies to EN IEC 61851-1 in regard of altitudes up to 2 000 m.

7.3 Ambient or operation temperature

According to EN IEC 61851-1:2019, Clause 11.8.2, an ambient temperature of −25/+40 °C shall be considered.

NOTE In some countries, other requirements may apply, for example. −35 °C or +50 °C

Consideration shall be given that due to continuous intense sunshine, the surface of the bus may get hotter and this can have an impact to the ACD.

7.4 Noise

Noise in regard of the ACD can be emitted by moving the ACD from or to home position, in the connecting moment and also when vehicle is driving by wind effects. Existing national or local requirements shall be taken into consideration.

EXAMPLE The “TA Laerm” in Germany.

7.5 Wind

The defined parking and contact tolerances shall also apply under the influence of wind forces. Wind forces have an impact on the vehicle and on the station, in detail for example the support of the ACD. The manufacturer of the ACD shall provide a datasheet that identifies the forces on the mounting interface of the ACD and the contact forces in dependence of wind speed. In addition to that, also the worst-case displacement by wind within the working range of the ACD shall be in that datasheet.

The responsibility of safe operation under all wind circumstances shall lie at the system integrator.A

8 Test specification and procedure

The following tables contain required tests for type testing and serial testing. The tables show testing standards and requirements for testing Automated coupler. These tests are under respect to cover both cases, that Automated coupler are from the same or from different manufacturers.

An ACD shall be tested with a standardized fixed ACD counterpart that is defined in the appropriate annex. A fixed ACD counterpart shall be tested with a standardized ACD that is defined in the appropriate annex.

These tests are valid for all systems described in all annexes. If there are system specific tests or requirements they are described in the respective annex.

Table 1 — Dimensional inspections

Test N°	Test Name	Description / Measurements to be performed / Requirements	Type Test	Serial Test
A1	Visual Inspection	System complete to drawing and structure	X	X
A2	Weighing	Mass of assembled ACD shall be within tolerance limits of the specification	X	
A3	Functional Dimensions	General functional dimensions, described the respective annexes, should be checked: - fixing point - contact arrangement and dimensions - keep out zone Dimensions shall be within the tolerances specified in the annex	X	
A4	Limited dimensions in home position		X	X
A5	complete working and moving range maximum extension		X	X
A6	arrangement and dimensions of all mounting points	checking the complete mounting interface to support	X	X