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Interested committees:

Title: BS EN IEC 61851-23-1 Electric vehicle conductive charging system

Part 23-1: DC Charging with an automatic connection system

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:

IEC 61851-23-1 ED1

DATE OF CIRCULATION:

2025-02-07

CLOSING DATE FOR VOTING:

2025-05-02

SUPERSEDES DOCUMENTS:

69/943/NP, 69/983/RVN

IEC TC 69 : ELECTRICAL POWER/ENERGY TRANSFER SYSTEMS FOR ELECTRICALLY PROPELLED ROAD VEHICLES AND INDUSTRIAL TRUCKS

SECRETARIAT:

Belgium

SECRETARY:

Mr Peter Van den Bossche

OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 23H

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

☒ 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.

Recipients of this document 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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TITLE:

Electric vehicle conductive charging system - Part 23-1: DC Charging with an automatic connection system

PROPOSED STABILITY DATE: 2027

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 23-1: DC electric vehicle supply equipment with an automated connection device

FOREWORD

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International Standard IEC 61851-23-1 has been prepared by IEC technical committee 69: Electric road vehicles and electric industrial trucks.

The text of this standard is based on the following documents:

FDIS	Report on voting
69/XX/FDIS	69/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table

185

186

This publication has been drafted in accordance with the ISO/IEC Directives, 185 Part 2.

This standard is to be read in conjunction with [IEC 61851-23 Ed 2.0] and [IEC 61851-1:2017].

The clauses of particular requirements in this standard supplement or modify the corresponding clauses in [IEC 61851-23 Ed 2.0] and [IEC 61851-1:2017]. Where the text of subsequent clauses indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of Part 23, these changes are made to the relevant text of Part 23, which then becomes part of this standard. Where no change is necessary, the words "This clause of Part 23 is applicable" are used. The new clauses, which are not included in Part 23, have a clause number starting from 201, e.g. 3.201, 201.1, etc. The annexes of this standard are numbered using double-alphabet, e.g. Annex AA, to be in line with the annexes in Part 23. If the in [IEC 61851-23 Ed 2.0] and [IEC 61851-1:2017] is read in conjunction with this document the following terms have to be replaced:

- Vehicle coupler, as defined by IEC 61851-1:2017, by 'Automatic coupler' as defined in clause 3
- Vehicle connector, as defined by IEC 61851-1:2017, by 'part of the automatic coupler mounted on the EV supply equipment'
- Vehicle inlet, as defined by IEC 61851-1:2017, by 'part of the automatic coupler mounted on the EV'

A list of all parts in the IEC 61851 series, published under the general title Electric vehicle conductive charging system, can be found on the IEC website.

In this standard, the following print types are used:

- *test specifications: italic type.*
- notes: smaller roman type.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The National Committees are requested to note that for this publication the stability date is December 2019.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The introduction and commercialisation of electric vehicles has been accelerated in the global market, responding to the global concerns on CO₂ reduction and energy security. Concurrently, the development of charging infrastructure for electric vehicles has also been expanding. As a complement to the DC EV supply equipment with a vehicle connector, DC supply equipment using an Automated connection device is recognized as an alternative solution for electric vehicles e.g. buses and trucks.

The international standardization of charging infrastructure with an automated connection device is indispensable for the diffusion of electric vehicles, and this standard is developed for the manufacturers' convenience by providing general and basic requirements for DC EV supply equipment using an automatic conductive connection to the vehicle.

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 23-1: DC electric vehicle supply equipment with an Automated connection device

1 Scope

This part of the IEC 61851 series, together with [IEC 61851-1:2017] and [IEC 61851-23 Ed 2.0], provides the requirements for DC EV supply equipment with an automated connection device (ACD) for conductive connection to the vehicle, with a rated maximum voltage at side A of up to 1 000 V AC or up to 1 500 V DC and a rated maximum voltage at side B up to 1 500 V DC.

NOTE 1 This standard includes information on EV for conductive connection, but limited to the necessary content for describing the power and signalling interface.

This document specifies the DC EV supply equipment with an automated connection device based on

- system B described in Annex BB of [IEC 61851-23 Ed 2.0].
- system C described in Annex CC of [IEC 61851-23 Ed 2.0].

The requirements for reverse power transfer (RPT) and BPT are under consideration and are not specified in this document.

EMC requirements for DC EV supply equipment are defined in [IEC 61851-21-2:2018].

This standard provides the general requirements for the control communication between a DC EV supply equipment and an EV.

The requirements for digital communication between DC EV supply equipment and electric vehicle for control of DC energy transfer are defined in [ISO 15118-20:2022] and [IEC 61851-24 Ed 2.0 CD].

This part only applies to automatic couplers of category 2: using an electro-mechanical interface: automatic coupler for an automated charging system according to [IEC 63407].

This part does not apply to automatic coupler of category 1 as described in [IEC 61851-27 CD]

This part does not apply to automatic coupler of category 3 as described in [IEC 61851-26 CD]

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

Requirements for systems not providing simple separation or protective separation between side A and side B are under consideration.

Requirements for EV supply equipment without current, voltage and/or power control are under consideration.

EV supply equipment in compliance with this document are not intended to provide energy transfer to a single EV with:

- multiple vehicle connectors of the same EV supply equipment; or
- multiple EV supply equipment.

NOTE Requirements for EVs mated to an EV supply equipment are specified in ISO 17409: 2020. ISO 17409 will be revised to ISO 5474 series (under development).

2 Normative references

IEC 61851-23:2023, Clause 2, is applicable except as follows:

277

278 *Addition:*

279 IEC 61496-1:2012 Safety of machinery - Electro-sensitive protective equipment - Part 1: General
280 requirements and tests

281

282 ISO 13855:2010 Safety of machinery — Positioning of safeguards with respect to the approach
283 speeds of parts of the human body

284

285 IEC 62128-1:2013 RAILWAY APPLICATIONS – FIXED INSTALLATIONS – ELECTRICAL SAFETY,
286 EARTHING AND THE RETURN CIRCUIT – Part 1: Protective provisions against electric shock

287

288 ISO 15118-8 Ed. 1 Vehicle to grid communication interface - Part 8: Physical layer and data link layer
289 requirements for wireless communication

290

291 ISO 15118-20 Road vehicles — Vehicle to grid communication interface — Part 20: 2nd generation
292 network and application protocol requirements

293

294 IEC 63407 Conductive charging of electric vehicles – Contact interface for automated connection
295 device (ACD).¹

296

297 **3 Terms and definitions**

298 IEC 61851-23:2023, Clause 3, is applicable except as follows:

299 *Addition:*

300 **3.1 Electric supply equipment**

301 **3.1.1 3.1.201**

302 **case D**

303 connection of an EV to a supply network utilizing an automatic coupler which has an ACD on
304 the EV supply equipment

¹ Under preparation. Stage at the time of publication: CD

**Key**

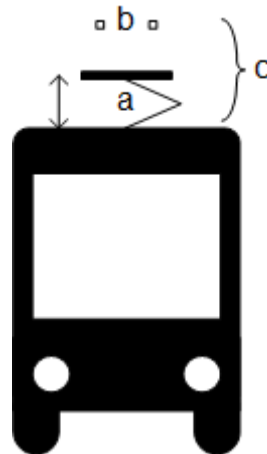
- a automated connection device
 b ACD counterpart
 c automatic coupler

Figure 201 – Case D connection

Note 1 to entry: The position of the ACD is an example implementation.

3.1.2 3.1.202**case E**

connection of an EV to a supply network utilizing an automatic coupler which has an ACD on the EV

**Key**

- a automated connection device
 b ACD counterpart
 c automatic coupler

Figure 202 – Case E connection

Note 1 to entry: The position of the ACD is an example implementation.

3.1.3 3.1.203**automated connection device****ACD**

active device where the physical connection providing an electromechanical interface between EV supply equipment and vehicle is made without user interaction

3.1.4 3.1.204**ACD counterpart**

passive device which is used in combination with an ACD to make the physical connection providing an electromechanical interface between EV supply equipment and vehicle without user interaction

3.1.5 3.1.205**automatic coupler**

system comprising of an ACD and ACD counterpart

3.1.6 3.1.206**mechanical disconnection**

physical disconnection between ACD and ACD counterpart

3.1.7 3.1.207**ground level automated connection device****glACD**

automated connection device located on ground level

3.1.8 3.1.208**electro-sensitive protection equipment****ESPE**

assembly of devices and/or components working together for protective tripping or presence-sensing purposes and comprising as a minimum of:

- a sensing device;
- controlling/monitoring devices;
- output signal switching devices and/or a safety-related data interface.

Note 1 to entry: The safety-related control system associated with the ESPE, or the ESPE itself, may further include a secondary switching device, muting functions, stopping performance monitor, etc. (see Annex A of IEC 61496-1:2012).

Note 2 to entry: A safety-related communication interface can be integrated in the same enclosure as the ESPE.

[SOURCE: IEC 61496-1:2012, 3.5]

3.1.9 3.1.209**charging device status**

The state of the ACD:

- Home (signal 1 / home position is active as defined in [IEC 63407]): position where the ACD is not engaged with its counterpart and where safe clearance is present with street and infrastructure
- Moving (signal 1 and signal 2 are inactive): ACD is between home and end position
- End position (signal 2 / working position is active as defined in [IEC 63407]): position reached when the ACD and the fixed ACD counterpart have mated and when the physical contact is established, and energy transfer is allowed

1.7 General terms

Addition:

3.1.10 3.7.201**arm's reach**

zone of accessibility to touch extending from any point on a surface where persons usually stand or move about to the limits which a person can reach with the hand, in any direction, without assistance

[SOURCE: IEC 60050-826, 826-12-19]

3.1.11 3.7.202**EV contactors**

contactors of the EV that connect the automatic coupler with the EV DC- bus

3.1.12 3.7.203**EV supply equipment contactors**

contactors of the EV supply equipment that connect the automatic coupler with the EV supply equipment DC- bus

3.1.13 3.7.204**automatic coupler of category 1**

ACD using a vehicle connector and a vehicle plug specified within IEC 62196-2, IEC 62196-3 or TS 63379 as specified in [IEC 61851-27 CD]

3.1.14 3.7.205**automatic coupler of category 2**

automatic coupler for an automated charging system according to [IEC 63407]

3.1.15 3.7.206**automatic coupler of category 3**

automatic coupler for an automated charging system according to [IEC 61851-26]

Note 1 to entry: IEC 61851-26 specifies the use of automatic coupler for both AC and DC charging.

4 General requirements

IEC 61851-23:2023, Clause 4, is applicable.

5 Classification

IEC 61851-23:2023, Clause 5, is applicable except as follows:

Addition:

1.201 Position of the ACD

- case D
- case E

6 Charging modes and functions

IEC 61851-23:2023, Clause 6, is applicable except as follows:

1.3 Functions provided in Mode 4**6.1.1 Mandatory functions in Mode 4****6.1.1.1 General**

Replacement:

The EV supply equipment shall supply a DC current or voltage to the EV battery system in accordance with a EVCC request.

The following functions shall be provided by EV supply equipment:

- continuous continuity checking of the protective conductor according to 6.3.1.2;
- verification that the EV is properly connected to the EV supply equipment according to 6.3.1.3;
- energization of the power supply to the EV according to 6.3.1.4;
- de-energization of the power supply to the EV according to 6.3.1.5;
- maximum allowable current according to 6.3.1.6;
- DC supply for EV according to 6.3.1.101;

- measuring current and voltage according to 6.3.1.102;
 - compatibility check according to 6.3.1.104;
 - insulation resistance check before energy transfer according to 6.3.1.106;
 - protection against overvoltage between DC+ and DC- according to 6.3.1.107;
 - control circuit supply integrity according to 6.3.1.108;
 - short circuit check before energy transfer according to 6.3.1.109;
 - user initiated shutdown according to 6.3.1.110;
 - overload protection for parallel conductors (conditional function) according to 6.3.1.111;
 - voltage limitation between side B live parts (DC+ and DC-) and protective conductor according to 6.3.1.112.
 - shutdown of EV supply equipment according to 6.3.1.113.
- The EV manufacturer should consider the requirements for overvoltage and overcurrent according to this document and ISO 17409.

If the EV supply equipment can supply more than one EV simultaneously, the EV supply equipment shall provide all functions listed above independently at each vehicle connector.

6.1.1.2 Continuous continuity checking of the protective conductor

Addition:

For systems with a case D or case E connection, protective conductor continuity between the EV supply equipment and the EV shall be monitored. For the rated voltage of 60 V DC or higher, the EV supply equipment shall trigger an emergency shutdown after the electrical continuity of protective conductor between EV supply equipment and EV is lost for 20 ms or more. The EV supply equipment may trigger an emergency shutdown when the electrical continuity of protective conductor between EV supply equipment and EV is lost for less than 20 ms.

NOTE This clause addresses only the continuity measurement between the DC EV supply equipment and the vehicle. The impedance level of the protective conductor connection is not addressed.

6.1.1.3 Verification that the EV is properly connected to the EV supply equipment

Replacement:

The EV supply equipment shall be able to determine that the EV is properly connected to the EV supply equipment.

Proper connection is assumed when the continuity of the control pilot circuit is detected and ACD has reached end position.

NOTE Signal 2 is defined in [IEC 63407].

1.3.1.103 Latching of the vehicle connector

IEC 61851-23:2023, 6.3.1.103, is not applicable.

1.3.1.106 Protection against overvoltage at side B between DC+ and DC

1.3.1.106.2 Protection against overvoltage at side B between DC+ and DC- by emergency shutdown

IEC 61851-23:2023, 6.3.106.2, is applicable except Table 103:

Table 103 – Voltage threshold for emergency shutdown reaction for system B and system C

Negotiated maximum voltage at side B (U)	Voltage threshold V
$U \leq 500 \text{ V}$	550

500 V < U ≤ 750 V	825
750 V < U ≤ 850 V	935
850 V < U ≤ 1 000 V	1 100
1 000 V < U ≤ 1250 V	1 375

1.3.1.107 Verification of vehicle connector latching

IEC 61851-23:2023, 6.3.1.107 is not applicable.

6.1.1.4 Control circuit supply integrity

Replacement of the 1st paragraph:

If an earth fault, short circuit or overcurrent is detected at side B, the power supply for the control circuit of the EV supply equipment shall not be interrupted until the FPT sequence is completed.

1.3.1.110 User initiated shutdown

Replacement:

The EV supply equipment may have means to allow the user to initiate the normal shutdown.

If such means are provided, compliance is checked for system C by the tests in CC.9.3.20. For system B, the test is under consideration.

1.3.1.112 Voltage limitation between side B live parts (DC+ and DC-) and protective conductor

6.1.1.4.1 Maximum voltage between side B live parts (DC+/DC-) and the protective conductor in case of an insulation fault at side B to the protective conductor

Addition:

For EV supply equipment based on case 3, with a rated maximum voltage of the EV supply equipment at side B of > 1000 V DC and ≤ 1 250 V DC: if a voltage more than 110 % of the present voltage at side B between DC+ and DC- is present for more than 1 s between side B live parts (DC+/DC-) and the protective conductor, the EV supply equipment shall trigger and complete an error shutdown in 4 s or less. See Figure 105.

For EV supply equipment based on case 3, with a rated maximum voltage of the EV supply equipment at side B of > 1000 V DC and ≤ 1 250 V DC: if a voltage more 1 250 V is present for more than 1 s between side B live parts (DC+/DC-) and the protective conductor, the EV supply equipment shall trigger and complete an error shutdown in 4 s or less. See Figure 105.

1.3.1.113 Shutdown of DC EV supply equipment

6.1.1.4.2 Error shutdown

Addition:

After the error shutdown is triggered, the ACD shall disconnect and go to home position.

NOTE Detecting an isolation error is considered a trigger for an error shutdown.

6.1.1.4.3 Emergency shutdown

Replacement:

After the emergency shutdown is triggered by the EV supply equipment, the EV supply equipment shall reduce:

- The present current at side B ≤ 5 A within 70 ms;

- and maintain the present voltage at side B ≤ 60 V between DC+ and DC-, between DC+ and the protective conductor, and DC- and the protective conductor in 1 s or less for system B, and in 80 ms or less for system C.

NOTE The timing can only be met if the vehicle contactors are opened and the capacitance between DC+ and DC- in the vehicle (between interface and contactors) is negligible.

After the emergency shutdown is triggered, the ACD shall disconnect and go to home position.

NOTE Pressing the emergency stop button is considered a trigger for an emergency shutdown.

Further requirements are specified in AA.4.3.5.3, BB.5.1 of [IEC 61851-23 Ed 2.0], CC.3.4 and KK.3.4.

NOTE A welded contactor on the vehicle can prevent the EV supply equipment to reduce the voltage.

Compliance for system B is checked by the following test. Compliance for system C is checked by CC.7.5.4, or KK.7.5.4.

The test system is shown in Figure 129 of [IEC 61851-23 Ed. 2.0].

The test shall be performed according to the following procedure.

- 1) *Connect the EV supply equipment to a test load with dedicated EV simulator with a test load for each system.*
- 2) *Start energy transfer with the procedure specified by the EV supply equipment manufacturer.*
- 3) *Confirm that V_{T8} is at the rated maximum voltage of the EV supply equipment at side B and the EV supply equipment is operating at the rated maximum current at side B.*
- 4) *Open the relay for each system as specified below:*
 - *for system B: S_{T4}*
- 5) *The EV supply equipment shall trigger and complete an emergency shutdown, displaying a relevant alarm or error information, if any, according to the following:*
 - *for system B, according to BB.5.1 and Table BB.3.*

6.1.2 Optional functions for Mode 4

1.3.1.3 Intentional and unintentional disconnection of the vehicle connector and/or the EV plug

IEC 61851-23:2023, 6.3.2.3, is not applicable.

6.1.2.1 Mode 4 using the combined charging system

IEC 61851-23:2023, 6.3.2.4, is not applicable.

7 Communications

IEC 61851-23:2023, Clause 7, is applicable except as follows:

1.3.101 Basic communication interface

Replacement:

Typical interfaces of control pilot function on DC EV supply equipment are specified in Annex BB, Annex CC and Annex KK. Each system shall carry out control pilot function through the control pilot conductors and terminals specified in [IEC 63407].

8 Protection against electric shock

IEC 61851-23:2023, Clause 8, is applicable except as follows:

1.101 General provisions

1.101.2 Intended use and reasonably foreseeable misuse

Replacement:

534 Considering intended use and reasonably foreseeable misuse:

- 535 – hazardous-live-parts shall not be accessible and accessible-conductive-parts shall not be
536 hazardous live

537 *Compliance for hazardous-live-parts is checked according to 8.102, 8.103 and 8.104.*

538 **1.101.4 Threshold of perception and startle reaction**

539 *Replacement:*

540 Protective measures shall be provided to prevent startle reactions during intended use and
541 reasonably foreseeable misuse, before, during and after an communication session, under
542 normal conditions and during single fault conditions. During the normal operating conditions,
543 perception may be possible.

544 NOTE 1 Curve a (boundary between AC-1/AC-2, DC-1/DC-2) of IEC 60479-1:2018, Table 11 and Table 13,
545 corresponds to the threshold of startle reaction in this document.

546 NOTE 2 The intended use includes but is not limited to handling of energy transfer accessories such as side B
547 cable assembly, vehicle connector and vehicle inlets, initiating a communication session, ending a communication
548 session, an ordinary person or animal entering or exiting the EV, opening and retrieving an item from the EV
549 trunk/boot or other storage areas, touching the vehicle chassis, and touching exposed metal parts of the EV supply
550 equipment.

551 For the current path, finger at the vehicle connector to feet, and hand at the vehicle chassis to
552 feet, shall be considered under normal and single fault conditions. The current path from hand
553 to hand shall be considered for special protection provisions. See IEC 60479.

554 Protection by means of limitation of touch current shall be provided, such that a steady-state
555 touch current flowing between simultaneously accessible conductive parts shall be less than:

- 556 – 0,5 mA AC/2 mA DC under normal operation, and
- 557 – 3,5 mA AC/10 mA DC under single fault condition.

558 *Compliance is checked by measurement according to 12.6.*

559 The EV supply equipment shall limit the discharge energy, such that discharge energy shall be
560 less than:

- 561 – 5 µJ under normal operation, and
- 562 – 0,5 mJ under single fault condition.

563 NOTE 3 The values are based on IEC 61140:2016, 5.2.7 b).

564 For relevant requirement, see 8.105.4.

565 *Compliance is checked by design review.*

566 Special protection shall be provided, such that in case of a failure of the provision for basic
567 protection and a simultaneous failure of the provision for fault protection of side B, the steady-
568 state touch current is less than or equal to curve b, the upper boundary of the DC-2 zone, as
569 specified in IEC 60479-1:2018, Figure 22 and Table 13.

570 Special protection shall be provided, such that in case of a failure of the provision for basic
571 protection and a simultaneous failure of the provision for fault protection of side B, the touch
572 current is less than or equal to the c2 curve as specified in IEC 60479-2:2019, Figure 23, and
573 in IEC 60479-1:2018, Figure 22, respectively.

574 NOTE 4 Because the system is autonomous, the restriction of the limitation of touch current under double fault
575 conditions are increased compared to IEC 61851-23. The system is out of reach (either by clearance or obstacle) in
576 line with IEC 62128-1:2013 and not accessible to humans.

577 The following parameters shall be used:

- 578 – a human body impedance of 575 Ω,
- 579 – the maximum Y-capacitances of the EV according ISO 17409:2020, and

– a worst-case asymmetric leakage resistance of the EV where energy transfer is still possible.

For system B, compliance is checked by design review according to Annex HH.

For system C, compliance is checked by the following test.

The test setup for system C is shown in Figure 209.

Pre-conditions for the test:

– For all systems:

a) The fault resistance is $575\ \Omega$, to represent the human body impedance.

b) The EV supply equipment manufacturer shall specify the operating point at which the EV supply equipment has the maximum energy stored in the Y-capacitance between side B live parts (DC+/DC-) and the protective conductor.

c) The test setup shall have the maximum EV Y-capacitance (CT7/ CT8) for the operating point specified in step b), as specified by ISO 17409.

NOTE 5 The EV supply equipment may switch in more power modules depending on the current demand, and/or put modules in series or parallel due to the voltage demand. This may influence the total Y-capacitance and leakage current.

d) Not applicable.

Additionally, for system C:

e) Approach the test point as specified in step b) according to CC.7.4.

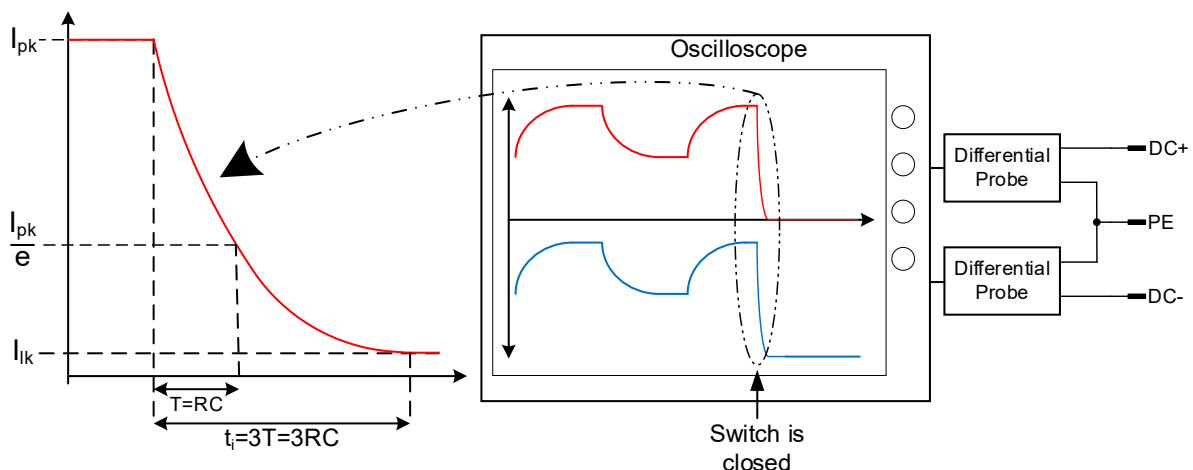


Figure 106 – Measurement of the touch leakage current

The test shall be executed as follows:

1) Close S_{T13} .

2) Determine the threshold of R_{T6} where the earth leakage current monitoring device (for system A) or IMD (for system C) trips.

3) Add $\leq 10\%$ to the trip value for R_{T6} in order to continuously charge with the maximum allowed asymmetric leakage resistance.

4) Wait until the operating point defined in step b) is reached.

5) Apply the defined fault resistance R_{T5} at the maximum voltage by closing S_{T11} .

NOTE 6 For system C, the maximum voltage includes the voltage superimposed by the IMD.

6) The currents through R_{T5} and R_{T6} can be determined by measuring the voltage over the known resistance R_{T5} .

7) Measure the discharge curve with an oscilloscope and extract the time constant of the discharge event $t_i = 3RC$ and determine $I_{RMS} = \frac{I_{Peak}}{\sqrt{6}}$. See Figure 106.

8) Measure the steady state leakage current I_{RT5} .

9) Repeat the test by:

- closing S_{T11} in step 1),
- determining the threshold with R_{T5} in step 2),
- applying the defined fault resistance R_{T6} by closing S_{T13} in step 5),
- measuring the voltage over R_{T6} in step 6), and
- measure I_{RT6} in step 8).

NOTE 7 The dynamic behaviour of the IMD (for example, switching) might influence this test. It may be necessary to repeat the test a few times to ensure that worst case condition is tested.

10) Check the expected results:

a) The steady-state leakage current I_{RT5} and I_{RT6} measured in step 8) are less than or equal to the DC2 limit (line b) in IEC 60479-1:2018, Figure 22 and Table 13.

NOTE 8 In steady-state, the DC2 limit is 25 mA.

b) The points (I_{RMS} , t_i) measured in step 7) are less than or equal to the C_1 limit in IEC 60479-2:2019, Figure 23, and in IEC 60479-1:2018, Figure 22.

NOTE 9 See Figure HH.4 in Annex HH.

1.102 Basic protection

8.1.1 General

Replacement:

Basic protection in DC EV supply equipment is employed to prevent persons from touching hazardous-live-parts. It shall be provided by one or more of the measures given in 8.102.2, 8.102.3, 8.102.4, 8.102.5, and 8.102.201.

Addition:

1.102.201 Basic insulation provided by air

Where basic insulation is provided by air, access to hazardous-live-parts or entering the danger zone shall be prevented by obstacles, protective barriers or enclosures as specified in 8.103.202, or by electro-sensitive protection device as specified in 8.103.203, or by protection by clearance as specified in 8.103.201.

NOTE As defined in IEC 61140 clause 5.2.2.2.

8.2 Fault protection

8.2.1 General

Replacement:

Fault protection provides protection against bodily harm due to contact with hazardous electrical energy during and after failure of the basic protection.

Fault protection shall be provided by one or more of the following measures:

- protective equipotential bonding in 8.103.2 in combination with the protective conductor;
- automatic disconnection of supply in 8.103.4;
- supplementary insulation in 8.103.5;
- electrically protective screening in 8.103.6;
- protection by clearance standing surface in 8.103.201;
- protection by obstacles in 8.103.202; and
- protection by electro-sensitive equipment in 8.103.203.

Fault protection shall be independent and additional to those for basic protection.

Addition:

1.102.201 Protection by clearance standing surface

The wraparound distance and the clearance, according to IEC 60364-4-41:2007, Annex B, Clause B.3, with a margin of safety, for touching in a straight line from the standing surface or instep shall be at least 3 m to provide protection against direct contact with live parts of an automatic coupler as shown in Figure 203.

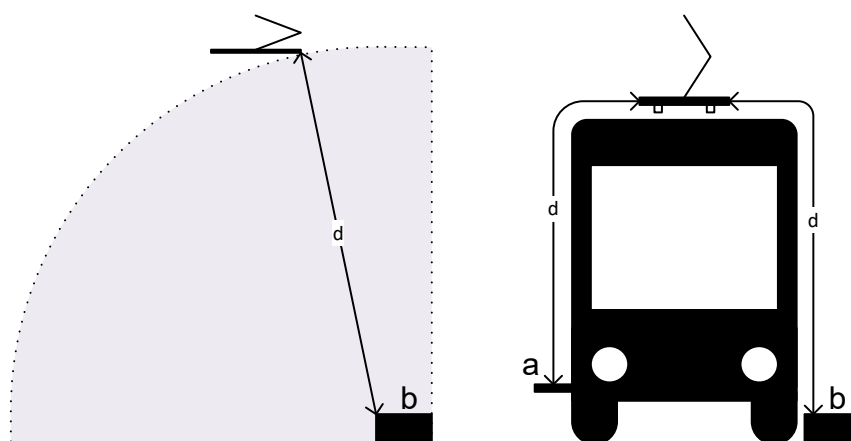
The clearances given in Figure 203 are minimum values.

NOTE 1 Touching in a straight line implies that live parts are accessible by a person from a standing surface without use of objects.

NOTE 2 These clearances have been determined on the basis of the arms reach as defined in IEC 60364-4-41 to which a margin of safety was added.

NOTE 3 The wraparound distance is based on the IEC 62128-1:2013, Figure 3.

NOTE 4 The wraparound distance of 3 m is defined in the vehicle regulation ECE/TRANS/WP.29/2017/138, chapter 7.



Key

a instep

b standing surface (for example, platform)

d ≥ 3 m

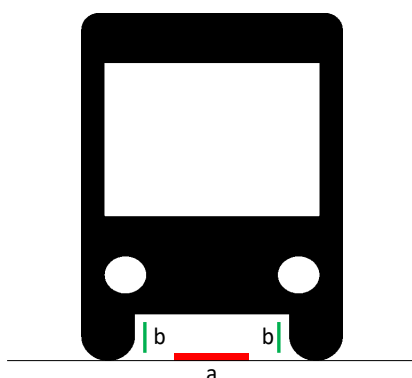
Figure 203 – Minimum clearances to accessible live parts

A marking according to 16.201 shall be applied.

8.2.2 Protection by obstacles

While mechanical connection of automatic coupler is established, the live parts shall not be accessible to unintentional contact, as defined in the IEC-60364-4-41 with the following additional clarifications.

NOTE During mechanical connection and mechanical disconnection the exposed voltage is < 60 V. In these phases there is no need to fulfil the electric shock protection by obstacles.

**Key**

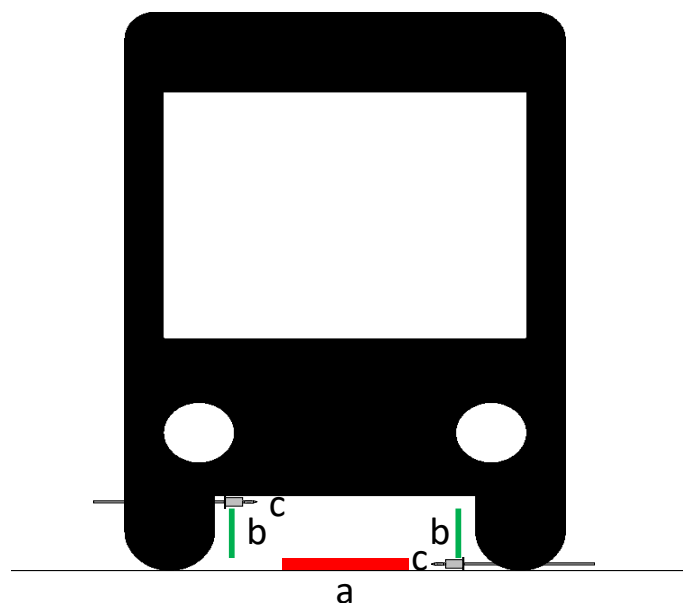
a live segment

b obstacle

Figure 204 – Protection by obstacles

To simulate the shape of human body and to allow test under the vehicle body, the test finger shall be mounted on a straight stick with a length $> 0,5$ m, this length shall be extended to allow access. This straight stick may access to the axle compartment above the live pads. The model shall not meander within the compartment.

The obstacles protection shall be designed in order to prevent from the insertion of the jointed test finger as defined in Figure 206.

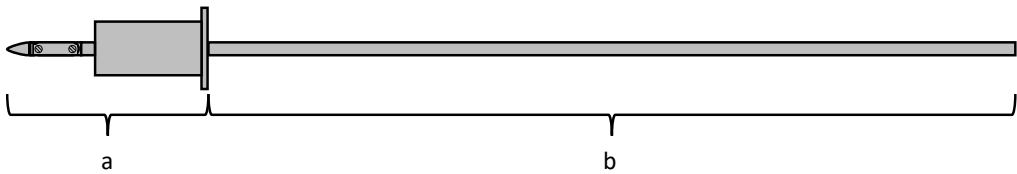
**Key**

a live segment

b obstacle

c jointed test finger mounted on a straight stick

Figure 205 – Protection by obstacles test method with the jointed test finger mounted on a straight stick.



Key

- a jointed test finger according to IEC 60529 test IPXXB
- b additional straight stick

Figure 206 – Jointed test finger mounted on a straight stick

NOTE The obstacle can be installed on the vehicle or on the infrastructure. The specific implementation is specified in the [IEC 63407].

A marking according to 16.201 shall be applied.

8.2.3 Protection by electro-sensitive equipment

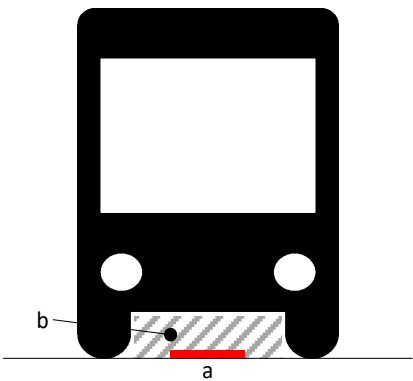
An electro-sensitive protective equipment (ESPE) provides a protection by causing the EV and the EV supply equipment to revert to a safe condition by means of an emergency shutdown before a person can be placed in the hazardous situation of being in contact with the live parts of an ACD system.

The ESPE shall be designed according to the standard IEC 61496.

The test of the ESPE is performed with the measurement of the time between the insertion of the jointed test finger (refer to Figure 206) in the approach zone and the time when the voltage drops below 60 V.

The approach zone triggering the ESPE (key b in Figure 207) shall provide a distance with the live part of the ACD greater than the distance reached by a human limb within the necessary time between the detection by the ESPE and the safe condition (de-energization time) with an exposed voltage dropping below 60 V DC.

The speed of human body parts to be considered is 2000 mm/s as defined in the standard ISO 13855.



Key

- a live segment
- b approach zone

Figure 207 – Protection by electro-sensitive equipment

1.105 Requirements of the separated EV supply equipment

8.2.4 General

Table 112 – Safety provisions for protection against electric shock for EV supply equipment at side B

Replacement:

Provisions for basic protection	Provisions for fault protection	Provisions for special protection
Protection in absence of a fault	Protection in case of a fault	
Basic insulation ⁹ : – (solid) basic insulation – basic insulation by air – inside barriers or enclosures	For class I ^j portions: – Protective separation between side A and side B ^{a, c} (8.105.5) – Protective equipotential bonding to accessible conductive parts (IEC 61140, 5.3.3.2), for example, for metal housing^a (8.105.1), in combination with: – for system B (BB.14) and system C (CC.4.6): mechanical robustness of the equipotential bonding by both: – minimum cross section of the protective conductor, and – using a vehicle coupler according to [IEC 63407] series. – Electrically protective screening (shielding) between hazardous-live-parts and accessible surfaces of parts of insulating material (8.105.5). – Protection by clearance standing surface (8.103.201) – Protection by obstacles (8.103.202) – Protection by electro-sensitive equipment (8.1.203) For class II ^j portions: – Double or reinforced insulation (8.105.5). Accessible SELV/PELV circuits – Protective separation between side B and the SELV/PELV circuit, or basic insulation and all of the conditions given in footnote ^e (8.105.5).	– Protective separation between side A and side B ^{a, c} (8.105.5) – Continuous continuity checking of the protective conductor and de-energization upon loss of continuity ^{a, d} (6.3.1.2) – For system B, the protective equipotential bonding withstands the short-circuit energy ⁱ (8.105.11, BB.14) – Perform an error shutdown when an asymmetric or symmetric insulation fault to protective conductor occurs, measured by the IMD ^a (8.105.1) – Multiple side Bs shall be separated from each other by basic insulation ^{a, f} (8.105.1) – Limitation of steady-state touch current (B) and impulse current (C2) ^a (8.101.4) – Limitation of Y-capacitance to < 2 000 nF per rail ^{a, b} (8.105.3)
^a The EV supply equipment shall provide this provision in order to support the protective provisions of an EV that is designed entirely as class I equipment or that contains portions that are designed as class I equipment. This applies even if the EV supply equipment itself is designed entirely as class II equipment. ^B The EV supply equipment shall provide this provision in order to support the protective provisions of an EV that uses limitation of touch energy as provision for fault protection in accordance with ISO 6469-3 Ed. 3 and ISO 17409 Ed. 1. ^C This single provision serves simultaneously as: – fault protection for class I equipment, or class I portions of the system, in case of a failure of the basic protection between live parts and accessible conductive parts, – special protection for class II equipment, or class II portions of the system, in case of a failure of the provision for basic protection and a simultaneous failure of the provision for fault protection. ^D This provision serves simultaneously: – to prevent hazards caused by “blinding” of the IMD/leakage current monitoring device for faults occurring “behind” a broken PE, – to prevent hazards caused by a loss of equipotential bonding for class I portions of the system. ^E Conditions: – the PELV circuit is connected to the protective conductor;		

	– no hazardous voltage or touch current occurs (see 8.10.3) in the PELV circuit due to an insulation fault between the PELV circuit and the DC circuit;
	– the IMD or earth leakage current monitoring device detects this insulation fault between the PELV circuit and the DC circuit, and triggers an error or emergency shutdown.
F	In order to consider only one EV for calculation of the Y-capacitance (C_y) and in order to prevent interference caused by multiple IMDs.
G	For each portion of the EV supply equipment, one of these provisions for basic protection shall be implemented. See also 5.2 of IEC 61140:2016.
H	Not applicable.
i	This short-circuit energy is a consequence of two independent faults, one from DC+ to the protective conductor and one from DC- to the protective conductor, of which one occurs in the EV and the other one occurs in the EV supply equipment.
J	Considering 7.3 and 7.4 of IEC 61140:2016.

731

732 **8.2.5 Impedance to protective conductor on side B**733 *Replacement of the 3rd paragraph:*

734 The reaction time of the insulation monitoring device or earth leakage current monitoring device
 735 shall be according to AA.3.1.2, BB.2.2 of [IEC 61851-23 Ed 2.0], BB.8 of [IEC 61851-23 Ed 2.0]
 736 CC.4.1.4 and KK.4.1.4. The value of the Y-capacitances shall ensure that the reaction time of
 737 the IMD or earth leakage current monitoring device is less than the limit. In the side B circuit,
 738 the Y-capacitance between DC+ and the protective conductor shall be < 2 000 nF. In the side
 739 B circuit, the Y-capacitance between DC- and the protective conductor shall be < 2 000 nF.

740 NOTE 1 The side B circuit Y-capacitance requirements for the EV supply equipment result in a total capacitance
 741 of 4 μ F.

742 NOTE 2 The vehicle should have a maximum capacity between chassis and DC of 2x2 μ F when the EV
 743 contactors are closed according to SAE J1772, SAE J3105 and ISO 17409.

744 NOTE 3 Y-capacitance may be added for EMC reasons.

745 NOTE 4 A connector based outlet on the same EV supply equipment shall comply with the Y-capacitance
 746 requirement of [IEC 61851-23 Ed 2.0].

747

748 **1.105.6 Stored energy**

749 IEC 61851-23:2023, 8.105.6, is not applicable.

750 **9 Conductive electrical interface requirements**

751 IEC 61851-23:2023, Clause 9, is applicable except as follows:

752 NOTE The numbering of the [IEC 61851-1:2017] is followed.

753 **9.1 General**754 *Replacement:*

755 The physical conductive electrical interface requirements between the vehicle and the DC EV
 756 supply equipment are as defined in:

- 757 – Annex A or Annex D of [IEC 63407], for system described in Annex CC case D
- 758 – Annex B of [IEC 63407], for system described in Annex CC case E
- 759 – Annex C of [IEC 63407], for system described in Annex KK
- 760 – System B is under consideration.

761 **1.4 Functional description of the universal interface**

762 IEC 61851-23:2023, 9.4, is not applicable.

763 **9.2 Functional description of a DC interface**764 *Replacement:*

The DC interface is described in:

- Annex A or Annex D of [IEC 63407], for system described in Annex CC case D
- Annex B of [IEC 63407], for system described in Annex CC case E
- Annex C of [IEC 63407], for system described in Annex KK
- System B is under consideration.

9.3 Functional description of the combined interface

IEC 61851-23:2023, 9.6, is not applicable.

9.4 Wiring of the neutral conductor

IEC 61851-23:2023, 9.7, is not applicable.

1.101 Avoidance of breaking under load

Replacement:

The automatic couplers are not intended for breaking under load. Disconnecting shall not take place under load under normal operation condition.

Automatic couplers may be designed for breaking under load as defined in IEC 63407, these shall be applied in case breaking under load is expected to occur because the normal operating condition cannot be met all the time.

In the case of disconnection under DC load due to a fault, no hazardous condition shall occur.

NOTE 1 In the case avoidance of breaking under load cannot be achieved, the current can be broken by the ACD. This situation would occur when reducing the current <5 A as a result of a Control Pilot state change from C to A change in accordance with clause CC.4.3, CC.4.4, KK.4.3 or KK.4.4.

NOTE 2 The situation will last for < 90 ms after the Control pilot or protective conductor is lost. (CC.4.3).

NOTE 3 Disconnection of ACD can be detected when one of the following occurs:

- interruption of interlock circuit(s), for example, control pilot, to mitigate electrical arcing and shock hazards;
- charging device status is not in end position anymore; or
- other means of detecting loss of contact.

NOTE 4 When the automatic coupler is used at the limit of the operating window and moves outside the operating window during energy transfer it may result in breaking under load.

10 Requirements for adaptors

IEC 61851-23:2023, Clause 10, is not applicable.

11 Cable assembly requirements

IEC 61851-23:2023, Clause 11, is not applicable.

NOTE ACD and ACD counterpart assembly requirements are specified in IEC 63407.

12 EV supply equipment constructional requirements and tests

NOTE The numbering of the [IEC 61851-1:2017] is followed.

IEC 61851-23:2023, Clause 12, is applicable except as follows:

1.4 IP degrees

1.4.2 Degrees of protection against solid foreign objects and water for basic, universal and combined and DC interfaces

Addition:

Indoor Use:

- ACD for case D and E when mated and not mated: at least IP00.

Addition:

Outdoor use:

- ACD for case D and E when mated and not mated: at least IP00.

1.7 Dielectric withstand voltage

1.7.102 Protection against transient overvoltages of atmospheric origin or due to switching

Replacement:

Any power or digital communication conductors connected to the EV supply equipment shall be protected against lightning or switching events by the use of appropriate means, such as:

- surge protective devices (SPDs) within the EV supply equipment;
- SPDs within side A of the EV supply equipment;
- environmentally protected installations of the EV supply equipment.

The EV supply equipment shall be classified with respect to the SPD function installed according to IEC 60364-5-53:2019, Clause 534. This information shall be provided in the installation manual.

The selection and erection of SPDs shall be done according to IEC 60364-5-53:2019, Clause 534.

SPDs shall be according to:

- IEC 61643-11 for AC, if any,
- IEC 61643-21 for digital communication conductors, if any,

SPDs should be according to IEC 61643-41, for DC, if any.

Surge protective components (for example, MOV, GDT, TVS) can be incorporated in the EV supply equipment for other reasons. If these components are used as part of an SPD, the SPD shall be tested according to IEC 61643.

The EV supply equipment shall provide a protection level at the connection point of the cables connecting the automatic coupler for system B or system C with a rated maximum voltage of the EV supply equipment at side B $\leq 1\,250$ V DC, for example, by using SPDs with a protection level of:

- 2 500 V DC between DC+ and protective conductor
- 2 500 V DC between DC- and protective conductor

Between the connection point of the cables connecting the automatic coupler and the interface of the vehicle additional transient overvoltages of atmospheric origin or due to switching can be induced.

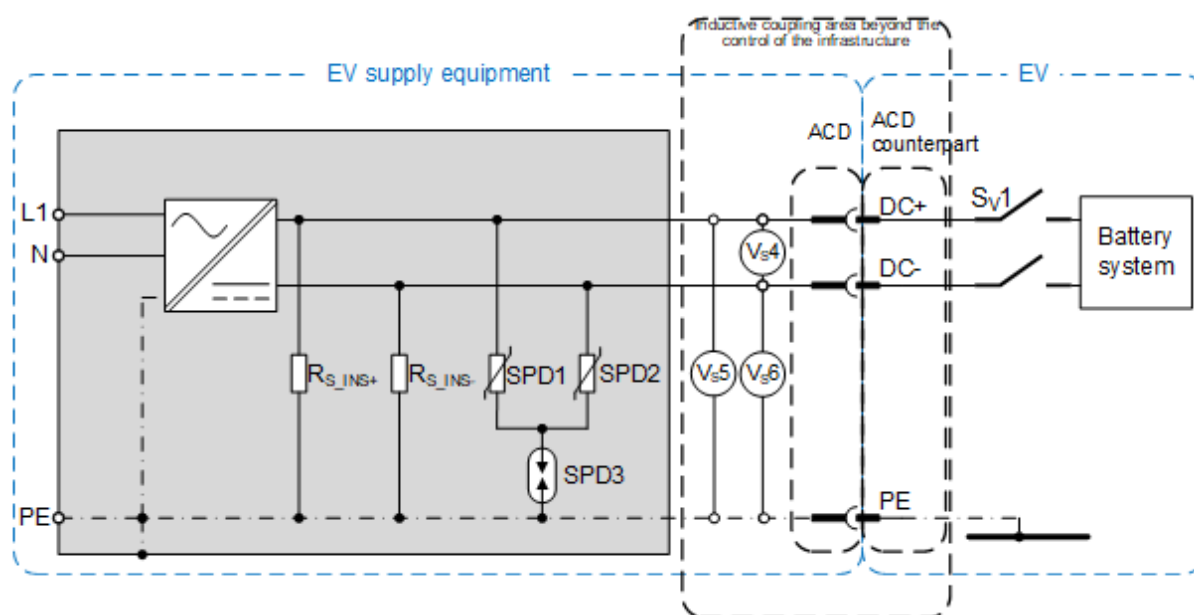
NOTE Simulations where the SPD located at the base of a pole supporting the ACD, have shown that the additional overvoltage can range from 7 kV (when lightning strikes at 2 m) to close to 0 V (when the lightning strikes at 10 m). As a result it can happen the vehicle is exposed to a transient overvoltage of between 2500 V and 9500 V. IEC 62305 can be used to calculate risks regarding lightning strikes.

The installation manual of the EV supply equipment shall include the following information for the erection and energy coordination of the SPDs for protection against transient overvoltages at the vehicle connector:

- The installation including the EV supply equipment has to provide a protection level between side B live parts (DC+/DC-) and protective conductor (for example, by using SPDs), at the vehicle connector of 2 500 V between DC+/DC- and protective conductor, for example, by using SPDs.

- Either:

- what types of SPDs are installed in the EV supply equipment, including the discharge current at which the protection level, or
 - that no SPD is installed.
- IEC 60364-5-53 provides information for the energy coordination of the SPDs included in EV supply equipment with upstream SPDs already erected in the supply network.
 - The IEC 62305 series provides information for protection against lightning. The test class and the surge/impulse current requirement (I_n and/or I_{imp}) for these devices may be determined according to the IEC 60364-5-53.
 - SPDs and other clamping devices limiting the voltage at the side B circuit, between live parts (DC+/DC-) and the protective conductor, shall have high impedance with a rated DC withstand voltage higher than the rated maximum voltage of the EV supply equipment at side B; for example, SPD-assemblies which include one or more “voltage switching type” SPD between side B live parts (DC+ and DC-) and the protective conductor can meet this requirement. A simultaneous transient overvoltage during a temporary overvoltage needs not to be considered, because this temporary overvoltage only occurs for a short period of time. See Figure 1.



Key

L,N	AC or DC supply network	V_{s4}	maximum side B voltage between DC+ and DC- of 1 250 V DC
PE	protective conductor	V_{s5}	worst case: temporary unbalanced voltage between DC+ and PE $\leq 1\,250$ V DC
DC+	positive terminal of side B	V_{s6}	worst case: temporary unbalanced voltage between DC- and PE $\leq 1\,250$ V DC
DC-	negative terminal of side B	SDP1, SDP2	surge protection devices, for example, varistors
R_{S_INS+} R_{S_INS-}	worst case: Internal insulation resistance ≥ 150 k Ω	SDP3	protective gap

Figure 1 – Example of an SPD-assembly having one voltage switching type SPD between side B live conductors (DC+/DC-) and protective conductor

- Suitable routing of the side B circuit minimizes induction loops and reduces the creation of surge voltages internally in side B. The loop area can be minimized by routing the live parts (DC+/DC-) of the side B circuit close to each other and close to the protective conductor, and by routing electrical and signal lines together. See IEC 62305-4.

- Shielding of internal lines, for example, using shielded cables or cable ducts, minimizes internally induced surges in case of long DC cables (> 10 m) or in case DC cables running close to an Lightning-Protection-System (LPS) – shields need to be bonded at either end.
- A common earthing and/or bonding network minimize potential differences and may reduce the magnetic field, see IEC 62305-4.

1.102 Power supply cords

IEC 61851-23:2023, 12.102 is not applicable.

1.108 Components bridging insulation

Replacement:

Components bridging insulation shall comply with the requirements of the level of insulation, for example, basic, reinforced or double, they are bridging.

Components bridging insulation shall meet the requirements in IEC 62368-1:2018, Clause 5.5 and be subjected to compliance testing as specified in that clause.

SPDs and other clamping devices limiting the voltage at the side B circuit, between live parts (DC+/DC-) and the protective conductor, shall have a rated DC withstand voltage of

- $\geq 1\,200$ V DC for EV supply equipment with a maximum voltage at side B $\leq 1\,000$ V DC,
- $\geq 1\,875$ V DC for EV supply equipment with a maximum voltage at side B $> 1\,000$ V DC.

13 Overload and short circuit protection

IEC 61851-23:2023, Clause 13, is applicable except as follows:

1.101 Short-circuit protection of the DC connection during energy transfer

Replacement of bullet a):

a) limit the peak current, including transient effects, to:

- For system B and system C: ≤ 30 kA at side B live parts (DC+ and DC-) of the vehicle connector.

14 Automatic reclosing of protective devices

IEC 61851-23:2023, Clause 14, is applicable except as follows:

Addition:

For case D and case E the EV supply equipment shall not provide automatic or remote reclosing of protective devices.

15 Emergency switching or disconnect

IEC 61851-23:2023, Clause 15, is applicable except as follows:

Replacement:

For EV supply equipment with a case D or case E connection an emergency switch according to ISO 13850 is mandatory.

Emergency switching or disconnect equipment shall be used either to disconnect the supply network from EV supply equipment and/or to disconnect the ACD (case D) or ACD counterpart (case E) from the supply network.

16 Marking and instructions

IEC 61851-23:2023, Clause 23, is applicable except as follows:

Addition:

1.201 Hazardous voltage marking

Marking the area around the automatic coupler with the international symbol for hazardous voltage (see Figure 208). The marking shall be placed in such way that it is recognizable from any direction prior to possible direct contact with the ACD.



Figure 208 - Hazardous voltage logo according to ISO 7010 – W012

101 Specific requirements for EV supply equipment

IEC 61851-23:2023, Clause 101, is applicable except as follows:

101.1 Specific requirements for separated EV supply equipment

16.1.1 Operating ranges for voltage, current, and power at side B

Addition:

– Operating Maximum Wind Speed from all directions

Replacement of NOTE 1:

NOTE 1 ISO 15118-20 specifies which of these parameters need to be communicated to the EV using digital communication, and how this is accomplished.

16.1.2 Periodic and random deviation (current ripple at side B during CCM)

Table 118 – Current ripple limit of DC EV supply equipment

Replacement:

Frequency ^a	Present current at side B (I)	
	I ≤ 125 A DC	I > 125 A DC
10 Hz	1,5 A _{pp} ^b	I x 1,2 % ^b
5 kHz	6 A _{pp} ^b	I x 4,8 % ^b
150 kHz	9 A _{pp} ^b	I x 7,2 % ^b
^a Cut-off frequency of the first order low pass filter. ^b Absolute maximum limit in A _{peak-to-peak}		

16.1.3 Periodic and random deviation (voltage ripple at side B during CVM)

Addition:

To determine the ripple, only frequencies above 1 Hz are considered.

101.2 Specific requirement for energy transfer with a thermal management system or thermal sensing only

IEC 61851-23:2023, Clause 101.2, is not applicable.

Addition:

101.201 Temperature of the terminals of the charging connector

The absolute temperature of the power contacts of the automatic coupler shall not exceed the limits specified in [IEC 63407] for system described in Annex CC and Annex KK. System B is under consideration.

17 Test methods

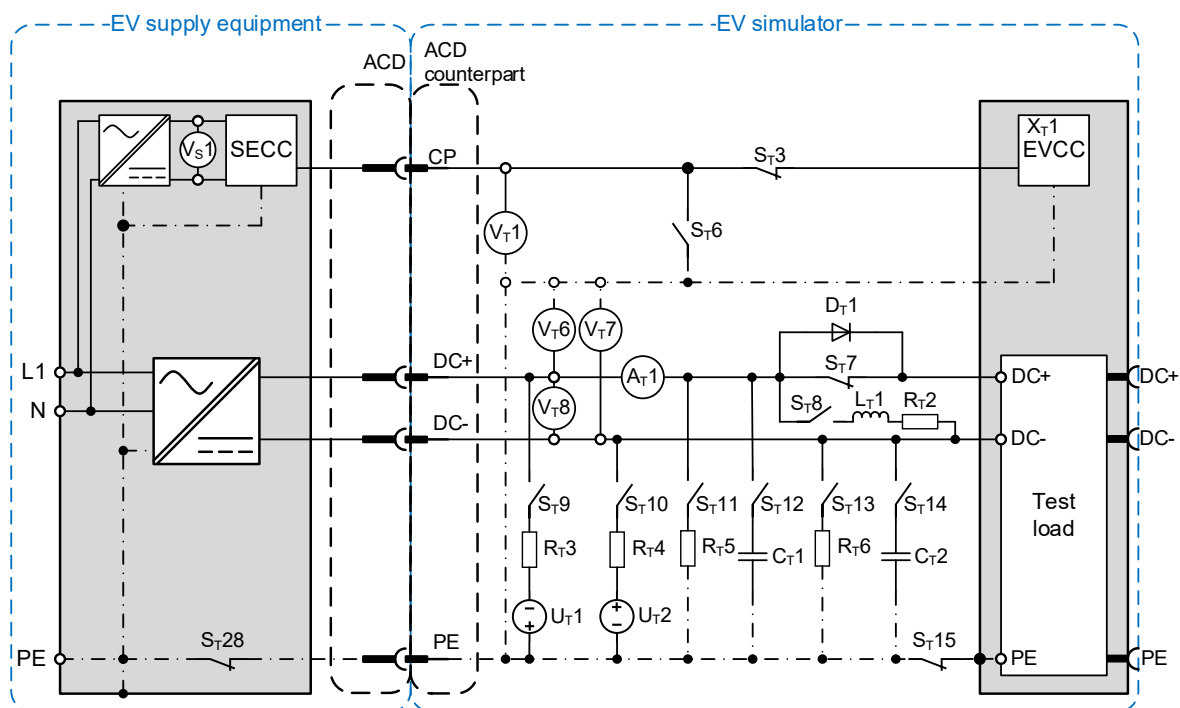
IEC 61851-23:2023, Clause 102, is applicable except as follows:

101.2 General test conditions

101.2.3 Test setups

Replacement:

The general test setup for system C with an automated connection device is shown in Figure 209.



Key

L1, N	AC or DC supply network	D _T	diode in the test setup
PE	protective conductor contact	S _T	switch or relay in the test setup
PP	proximity pilot conductor contact	C _T	capacitor in the test setup
CP	control pilot conductor contact of system C	V _T	voltmeter in the test setup
DC+	positive terminal of side B	R _T	resistor in the test setup
DC-	negative terminal of side B	L _T	inductor in the test setup
SECC	supply equipment communication controller	U _T	voltage source in the test setup
EVCC	electric vehicle communication controller	V _S	voltmeter in the EV supply equipment
Test load	test load according to 102.2.3, unless otherwise specified (see Figure 132)	X _T	voltage source for the proximity pilot circuit
A _T	ammeter in the test setup		

Figure 209 – General test setup for system C with an automated connection device

101.2.4 Test load

Table 120 – Recommended circuit parameters of the test load

Replacement:

Symbol	System C
L _{T3} + L _{T4}	Up to 100 µH

C _T 5	5 600 µF
C _T 6	470 µF
C _T 7, C _T 8	2 µF
S _T 17, S _T 18	As specified in respective test
S _T 19	As specified in respective test
S _T 20	Open
S _T 21	Closed
S _T 22	As specified in respective test
S _T 23, S _T 24, S _T 25, S _T 26, S _T 27	As specified in respective test
R _T 10	Variable (50 mΩ to 100 mΩ)
R _T 11	Variable (0,1 mΩ to 2 mΩ)
R _T 12	10 Ω (< 500 V) 50 Ω (500 V to 1 000 V)
R _T 13, R _T 14	As specified in respective test
R _T 15	0 Ω
U _T 4	0 V to 1 250 V
U _T 5	Not used

960

961 **201ACD specific requirements**

962 The physical conductive electrical interface requirements between the vehicle and the DC EV
 963 supply equipment are as defined in [IEC 63407].

964 **17.1 Pairing and position verification**

965 For case D, pairing between EV and EV supply equipment shall be ensured before the ACD is
 966 moved.

967 Additionally, for case D, the position of the vehicle relative to the ACD shall be verified before
 968 the ACD is moved to ensure that there can be no possibility of hazardous situations. For
 969 example, collision with a moving vehicle or person.

970 NOTE 1 Pairing and position verification have to be ensured before moving the case D ACD to prevent the
 971 ACD potentially interfering with normal road traffic and causing a dangerous collision.

972 NOTE 2 Additional positioning information that assists the driver to park is not required, but may be beneficial
 973 to make the energy transfer more robust.

974 NOTE 3 ISO 15118-8 requires additional pairing when the conductive connection is made (see 7.2.9.2)

975 **17.2 Home position of ACD**

976 The ACD shall not interfere with road traffic when in home position. When the ACD does
 977 interfere with normal road traffic due to single fault conditions there shall be a warning signal.

978 At the end of the energy transfer session the ACD shall return to its home position within a
 979 defined timeframe. The timeframe shall be specified by the manufacturer of the ACD.

980 When the ACD is not in home position the EV supply equipment shall not initiate a new energy
981 transfer session.

982 A risk assessment according to ISO 13849-1 is required for the overall system in its environment
983 regarding the situation that the ACD is not in the home position. This risk assessment shall
984 require a specific performance level for home position determination of the ACD.

985 **17.3 Loss of power**

986 In case the supply power for the actuator of the ACD is lost, the EV supply equipment shall
987 perform an emergency shutdown and the ACD shall return to its home position.

988 NOTE Returning to the home position can be achieved by, for example, a spring or backup battery or can be even
989 done manually.

990 In case of a power outage the ACD shall be automatically returned to its home position within
991 60 s or it shall be possible to manually move the ACD to its home position.

992 **17.4 Welding detection**

993 The EV supply equipment shall detect welding of its contactors. In case welding is detected it
994 shall not start an energy transfer session.

995



996 IEC 61851-23:2023, Annex AA, is not applicable.

Annex A

(normative)

DC EV supply equipment of System B with an automated connection device

AA.1 General

Replacement:

Annex BB provides specific requirements for DC EV supply equipment by using an automatic coupler.

This annex only applies to Category 2 system according to 3.7.205.

The system may only be based on the system B as described in Annex BB of [IEC 61851-23 Ed 2.0].

The maximum system output voltage shall be limited to 1 250 V DC or less dependent on the components of the system.

AA.2 Circuit diagrams

AA.2.1 Circuit diagram

Replacement:

Figure BB.1 shows the circuit diagram of a system B EV supply equipment used for automatic coupler.

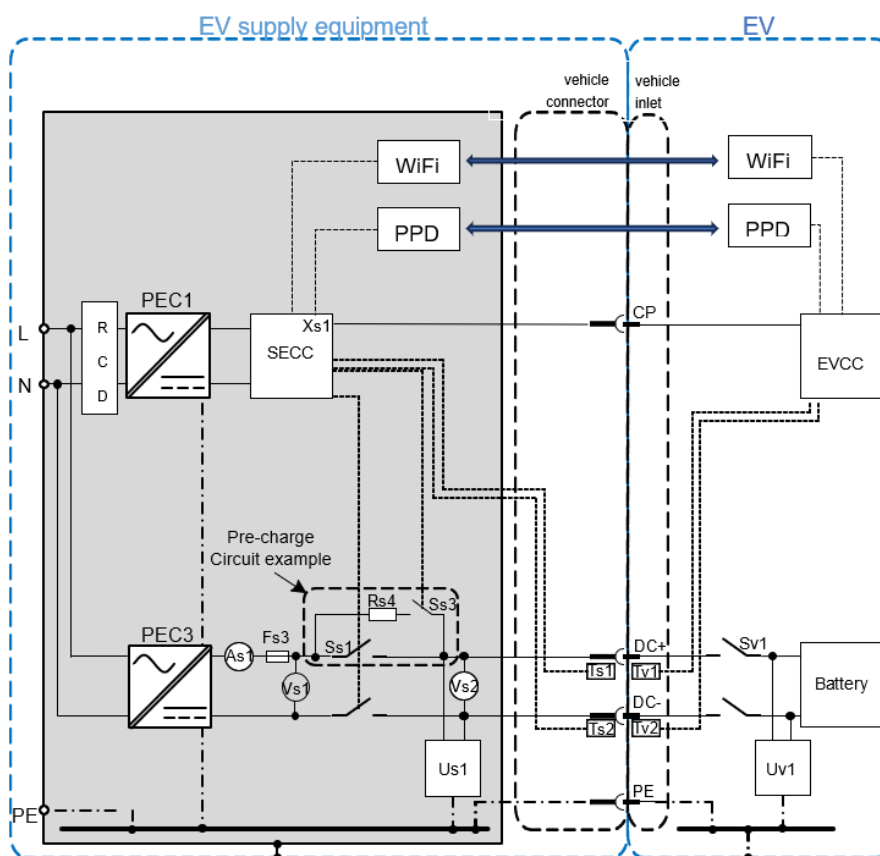


Figure BB.1 Circuit diagram of a system B EV supply equipment with automatic coupler

1017

Table BB.1 Definition of symbols of circuit diagram

Symbol	Definition	Symbol	Definition
L, N	AC or DC supply network	S_S	Switch or relay in the EV supply equipment
PE	Protective conductor contact	S_V	Switch or relay in the EV
CP	Control pilot conductor contact of system B	A_S	Ammeter in the EV supply equipment
PPD	Pairing and positioning device	R_S	Resistor in the EV supply equipment
DC+	Positive terminal of side B	U_S	IMD of the EV supply equipment
DC-	Negative terminal of side B	U_V	IMD of the EV
SECC	Supply equipment communication controller	V_S	Voltmeter in the EV supply equipment
EVCC	Electric vehicle communication controller	F_S	Over-current protection device in the EV supply equipment
PEC1, PEC3	Power electronic converter	T_S	Temperature sensor in the EV supply equipment
X_{S1}	Voltage source in the EV supply equipment	T_V	Optional Temperature sensor in the EV
PPD	Pairing and positioning device	WiFi	Communication between EV supply equipment and EV

1018 **A.1.1 Requirements of IMD and discharge circuit**

1019 IEC 61851-23:2023, BB.2, is applicable.

1020 **AA.2.200 Wireless proximity detection**

1021 PPD in Figure BB.1 are near-field wireless communication device and shall be used for
 1022 proximity detection and ID recognition. The wireless communication shall be initialized after
 1023 PPD recognizes each other.

1024 Function to detect the stationary condition (zero speed) of the EV shall be required. ACD shall
 1025 only start to mate when immobilization of the EV is confirmed.

1026 **A.1.2 Temperature monitoring and the detection of contact reliability**

1027 The ACD should have a means to monitor the temperature of the DC+ and DC- rails and to
 1028 detect the reliable contact of the ACD by pressure sensing or other methods.

1029 **AA.3 Parameters of control pilot circuit**

1030 *Replacement:*

1031 **A.1.3 Control Pilot**

1032 Figure BB.2 shows the general definitions and functions of the control pilot (CP).

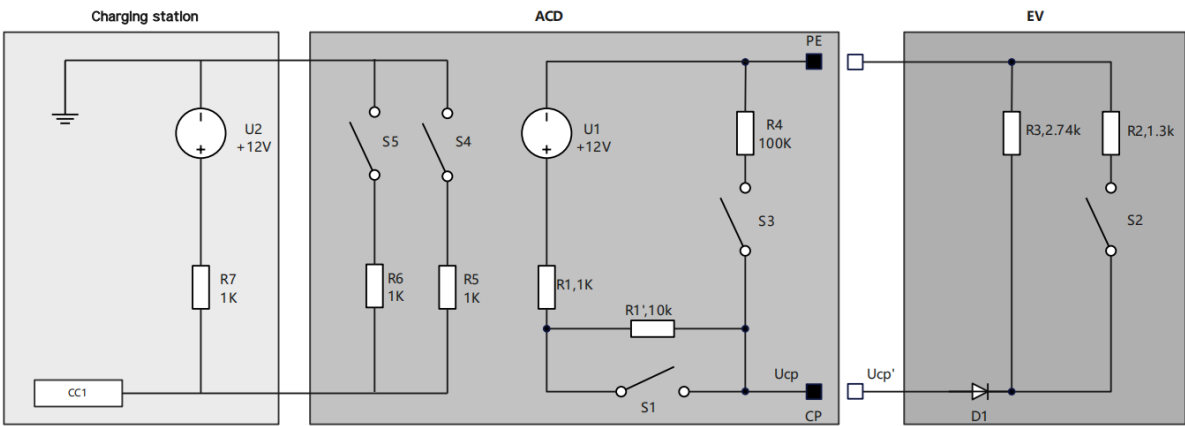


Figure BB.2 Control Pilot

NOTE1: Switch S3 and resistor R4 are optional.

EV supply equipment starts charging by closing S1 and terminates charging by opening S1.

EV starts charging by closing S2 and terminates charging by opening S2.

Both EV supply equipment and EV can identify whether the PE or CP line is broken or not between EVSE and EV.

Table BB.2 Control pilot circuit values and parameters

	Parameter	Symbol	Unit	Max. value	Nominal value	Min. value
EV supply equipment	Generator open circuit positive voltage	U1	V	12.6	12	11.4
	Equivalent source resistance	R1	Ω	1030	1000	970
		R1'	kΩ	10.3	10	9.7
		R4	kΩ	103	100	97
		R5	Ω	1030	1000	970
		R6	Ω	1030	1000	970
		R7	Ω	1030	1000	970
	Ucp states detected	Ucp(A)	V	13	12	11
		Ucp(B)	V	10	9	87
		Ucp(C)	V	7	6	5
		Ucp(D1)	V	4	3	2
		Ucp(D2)	V	2	1.5	1
EV	Equivalent source resistance	R2	Ω	1339	1300	1261
		R3	Ω	2822	2740	2658
	Diode (D) voltage drop (1– 10 mA, -40 °C to + 85 °C)	D1	V	0.85	0.7	0.55