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Incorporating corrigendum May 2016



BSI Standards Publication

Electric vehicle conductive charging system

Part 23: DC electric
vehicle charging station
(IEC 61851-23:2014)

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National foreword

This British Standard is the UK implementation of EN 61851-23:2014. It is identical to IEC 61851-23:2014, incorporating corrigendum May 2016.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum May 2016 is indicated in the text by AC1 AC1.

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 61851-23

May 2014

ICS 43.120

English Version

**Electric vehicle conductive charging system -
Part 23: DC electric vehicle charging station
(IEC 61851-23:2014)**

Système de charge conductive pour véhicules électriques -
Partie 23: Borne de charge en courant continu pour
véhicules électriques
(CEI 61851-23:2014)

Konduktive Ladesysteme für Elektrofahrzeuge - Teil 23:
Gleichstromladestationen für Elektrofahrzeuge
(IEC 61851-23:2014)

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Foreword

The text of document 69/272/FDIS, future edition 1 of IEC 61851-23, prepared by IEC/TC 69 "Electric road vehicles and electric industrial trucks" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61851-23:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-01-15
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-04-15

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Endorsement notice

The text of the International Standard IEC 61851-23:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60364-7-722	NOTE	Harmonised as EN 60364-7-722 (not modified).
IEC 61851-21-2	NOTE	Harmonised as en 61851-21-2 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60364-5-54	2011	Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors	HD 60364-5-54	2011
IEC 60950-1 (mod)	2005	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	2006
+A1 (mod)	2009		+A1	2010
+A2 (mod)	2013		+A2	2013
IEC 61140		Protection against electric shock - Common aspects for installation and equipment	EN 61140	
IEC 61439-1	2011	Low-voltage switchgear and controlgear assemblies - Part 1: General rules	EN 61439-1	2011
IEC/TS 61479-1	2005	Effects of current on human beings and livestock - Part 1: General aspects	-	-
IEC 61557-8	-	Electrical safety in low voltage distribution systems up to 1 000 v a.c. And 1 500 v d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 8: insulation monitoring devices for it systems	EN 61557-8	-
IEC 61558-1	2005	Safety of power transformers, power supplies, reactors and similar products - Part 1: General requirements and tests	EN 61558-1	2005
IEC 61851-1	2010	Electric vehicle conductive charging system - Part 1: General requirements	EN 61851-1	2011
IEC 61851-24	2014	Electric vehicle conductive charging system - Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging	EN 61851-24	2013
IEC 62052-11	-	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment	EN 62052-11	-
IEC 62053-21	-	Electricity metering equipment (a.c.) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)	EN 62053-21	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62196-3	-	Plugs, socket-outlets, and vehicle couplers - conductive charging of electric vehicles - Part 3: Dimensional compatibility and interchangeability requirements for dedicated d.c. and combined a.c./d.c. pin and contact- tube vehicle couplers	EN 62196-3	-
ISO/IEC 15118-2	-	Road vehicles – Vehicle to grid communication interface - Part 2: Technical protocol description and open systems interconnections (OSI) layer requirements	-	-
ISO/IEC 15118-3	-	Road vehicles - Vehicle to grid communication- interface - Part 3 Physical layer requirements	-	-
IEC/TS 61479-1	2005	Effects of current on human beings and livestock - Part 1: General aspects	-	-
ISO 11898-1	-	Road vehicles - Controller area network (CAN) - Part 1: Data link layer and physical signalling	-	-
DIN SPEC 70121	-	Electromobility - Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging in the Combined Charging System	-	-

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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 a.c. charging system, d.c. charging is recognized as an effective solution to extend the available range of electric vehicles. The international standardization of charging infrastructure is indispensable for the diffusion of electric vehicles, and this standard is developed for the manufacturers' convenience by providing general and basic requirements for d.c. EV charging stations for conductive connection to the vehicle.

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 23: DC electric vehicle charging station

1 Scope

This part of IEC 61851, together with IEC 61851-1:2010, gives the requirements for d.c. electric vehicle (EV) charging stations, herein also referred to as "DC charger", for conductive connection to the vehicle, with an a.c. or d.c. input voltage up to 1 000 V a.c. and up to 1 500 V d.c. according to IEC 60038.

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

This part covers d.c. output voltages up to 1 500 V.

Requirements for bi-directional power flow are under consideration.

NOTE 2 Typical diagrams and variation of d.c. charging systems are shown in Annex DD.

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

This part specifies the d.c. charging systems A, B and C as defined in Annexes AA, BB and CC.

NOTE 3 Typical configuration of d.c. EV charging system is shown in Annex EE.

EMC requirements for d.c. EV charging stations are defined in IEC 61851-21-2.

This standard provides the general requirements for the control communication between a d.c. EV charging station and an EV. The requirements for digital communication between d.c. EV charging station and electric vehicle for control of d.c. charging are defined in IEC 61851-24.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC/TS 60479-1:2005, *Effects of current on human beings and livestock - Part 1: General aspects*

IEC 60950-1:2005, *Information technology equipment - Safety - Part 1: General requirements*
Amendment 1:2009
Amendment 2:2013

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61439-1:2011, *Low voltage switchgear and controlgear assemblies – Part 1: General rules*

IEC 61557-8, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems*

IEC 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 61851-1:2010, *Electric vehicle conductive charging system – Part 1: General requirements*

IEC 61851-24:2014, *Electric vehicle conductive charging system – Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging*

IEC 62052-11, *Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 11: Metering equipment*

IEC 62053-21, *Electricity metering equipment (a.c.) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)*

IEC 62196-3:—¹, *Plugs, socket-outlets, and vehicle couplers – Conductive charging of electric vehicles – Part 3: Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and tube-type contact vehicle couplers*

ISO/IEC 15118-2:—¹, *Road Vehicles – Vehicle to grid communication interface – Part 2: Technical protocol description and Open Systems Interconnections (OSI) layer requirements*

ISO/IEC 15118-3:—¹, *Road Vehicles – Vehicle to grid communication interface – Part 3: Physical layer and data link layer requirements*

ISO 11898-1, *Road vehicles – Controller area network (CAN) – Part 1: Data link layer and physical signalling*

DIN SPEC 70121, *Electromobility – Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging in the Combined Charging System*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61851-1 and IEC 61668-1, as well as the following apply.

NOTE The definitions included in this part are those having general application herein. Definitions applying to isolating transformers, safety isolating transformers, switch mode power supplies, and their construction are included in IEC 61558-1.

3.101

d.c. EV charging system

system composed of a DC charger, cable assembly and the equipment on EV that is required to fulfil the charging function including digital communication for charging control

3.102**isolated d.c. EV charging station**

d.c. EV charging station with d.c. circuit on output side which is electrically separated by at least basic insulation from a.c. circuit on power system side

3.103**non-isolated d.c. EV charging station**

d.c. EV charging station with d.c. circuit on output side which is not electrically separated by at least basic insulation from the supply system

3.104**regulated d.c. EV charging station**

d.c. EV charging station that supplies vehicle battery with a charging current or charging voltage in accordance with the request from vehicle

3.105**non-regulated d.c. EV charging station**

under consideration

3.106**d.c. charging control function****DCCCF**

function embedded in a d.c. EV charging station which controls d.c. power output following VCCF direction

Note 1 to entry: This note applies to the French language only.

3.107**vehicle charging control function****VCCF**

function in a vehicle which controls the charging parameters of off-board d.c. EV charging station

Note 1 to entry: This note applies to the French language only.

3.108**CCC****controlled current charging**

energy transfer method that the d.c. EV charging station regulates charging current according to the current value requested by the vehicle

Note 1 to entry: This note applies to the French language only.

3.109**CVC****controlled voltage charging**

energy transfer method that the d.c. EV charging station regulates charging voltage according to the voltage value requested by the vehicle

Note 1 to entry: This note applies to the French language only.

3.110**control circuit**

circuit for signal and digital communication with vehicle, and for the management of charging control process

3.111**primary circuit**

a circuit that is directly connected to the a.c. mains supply, and includes the primary windings of transformers, other loading devices and the means of connection to the a.c. mains supply

3.112**secondary circuit**

circuit that has no direct connection to a primary circuit and derives its power from a transformer, converter or equivalent isolation device

3.113**insulation**

all the materials and parts used to insulate conductive elements of a device, or a set of properties which characterize the ability of an insulation to provide its function

[SOURCE: IEC 60050-151:2001, 151.15.41 and IEC 60050-151:2001, 151.15.42, modified — Both these definitions have been combined and the note to entry has been deleted.]

3.114**isolation**

function intended to make dead for reasons of safety all or a discrete section of the electrical installation by separating the electrical installation or section from every source of electric energy

[SOURCE: IEC 60050-826:2004, 826.17.01]

3.115**maximum voltage limit**

upper limit value of charging voltage that is notified by the vehicle to the d.c. EV charging station, and is used for overvoltage protection of vehicle battery

3.116**protective conductor****PE**

conductor provided for purposes of safety, for example protection against electric shock

Note 1 to entry: This note applies to the French language only.

[SOURCE: IEC 60050-195:1998, 195.02.09]

3.117**charging state**

physical status of d.c. EV charging system

3.118**emergency shutdown**

shutdown of d.c. EV charging station that results in the termination of charging, caused by a failure detected by the d.c. EV charging station or the vehicle.

4 General requirements

This clause of Part 1 is applicable.

5 Rating of the supply a.c. voltage

This clause of Part 1 is applicable.

6 General system requirement and interface

This clause of Part 1 is applicable except as follows:

6.2 EV charging mode

Replacement:

EV charging mode of this standard is Mode 4.

Mode 4 charging in this part means the connection of the EV to the supply network utilizing a d.c. EV charging station (e.g. off-board charger) where the control pilot function extends to the d.c. EV charging station.

Pluggable d.c. EV charging stations, which are intended to be connected to the a.c. supply network (mains) using standard plugs and socket outlets, shall be compatible with residual current device with characteristics of type A. The pluggable d.c. EV charging station shall be provided with an RCD, and may be equipped with an overcurrent protection device.

Further requirements for pluggable d.c. EV charging stations are under consideration.

NOTE 1 In some countries, the use of an RCD of Type AC for d.c. EV charging station (a.c. mains) is allowed: JP.

NOTE 2 In some countries, US and CA, the use of a system of protection is required that is intended to interrupt the electric circuit to the load when:

- a) a fault current to earth (ground) exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit,
- b) the earthing (grounding) path becomes open-circuited or of excessively high impedance, or
- c) a path to earth (ground) is detected on an isolated (ungrounded) system.

Replacement:

6.3 Types of EV connection

Replacement:

6.3.1 General description

The connection of EVs using cables shall be carried out in case of C connection as specified in Part 1.

6.3.3 Adaptors

Replacement:

Adaptors shall not be used to connect a vehicle connector to a vehicle inlet.

Replacement:

6.4 Functions provided in d.c. charging

The d.c. EV charging station shall supply a d.c. current or voltage to the vehicle battery in accordance with a VCCF request.

For non-regulated charging: under consideration.

Replacement:

6.4.1 Mode 4 charging functions

These functions shall be provided by d.c. charging system as given below:

- verification that the vehicle is properly connected;
- protective conductor continuity checking (6.4.3.2);
- energization of the system;
- de-energization of the system (6.4.3.4);
- d.c supply for EV (6.4.3.101);
- measuring current and voltage (6.4.3.102);
- retaining / releasing coupler (6.4.3.103);
- locking of the coupler (6.4.3.104);
- compatibility assessment (6.4.3.105);
- insulation test before charging (6.4.3.106);
- protection against overvoltage at the battery (6.4.3.107);
- verification of vehicle connector voltage (6.4.3.108);
- control circuit supply integrity (6.4.3.109);
- short circuit test before charging (6.4.3.110);
- user initiated shutdown (6.4.3.111);
- overload protection for parallel conductors (conditional function) (6.4.3.112);
- protection against temporary overvoltage (6.4.3.113);
-  – emergency shutdown (6.4.3.114). 

Replacement:

6.4.2 Optional functions

These functions, if provided, should be provided by d.c. charging system as optional as given below:

- determination of ventilation requirements of the charging area;
- detection/adjustment of the real time available load current of the  DC charger .
- selection of charging current;
- wake up of d.c. EV charging station by EV (6.4.4.101);
- indicating means to notify users of locked status of vehicle coupler.

Other additional functions may be provided.

NOTE 1 Un-intentional live disconnect avoidance functions may be incorporated in the latching function interlock system.

NOTE 2 A positive means to prevent unintentional disconnect is required in some countries: US

NOTE 3 Primary protection against overvoltage and overcurrent of vehicle battery is the responsibility of the vehicle.

Replacement:

6.4.3 Details of functions for DC charging

Replacement:

6.4.3.2 Protective conductor continuity checking

For isolated systems, protective conductor continuity between the d.c. EV charging station and the vehicle shall be monitored. For the rated voltage of d.c. 60 V or higher, the d.c. EV charging station shall perform an emergency shutdown (see 6.4.3.114) within 10 s after a loss

of electrical continuity of the protective conductor between d.c. EV charging station and EV (emergency shutdown).

For non-isolated systems, in case of loss of earthing conductor continuity, the non-isolated d.c. EV charging station shall be disconnected from a.c. supply network (mains). Earthing conductor continuity between the d.c. EV charging station and the vehicle shall be monitored. For the rated voltage of d.c. 60 V or higher, the d.c. EV charging station shall perform an emergency shutdown within 5 s after a loss of electrical continuity of the protective conductor between d.c. EV charging station and EV.

NOTE The isolated d.c. EV charging station can be disconnected from a.c. mains when AC1 protective conductor AC1 continuity is lost.

6.4.3.4 De-energization of the system

Addition:

In the case of failure in control circuit of d.c. EV charging station, such as short-circuit, earth leakage, CPU failure or excess temperature, the d.c. EV charging station shall terminate the supply of charging current, and disconnect the supply of control circuit. In addition, the conductor, in which earth fault or overcurrent is detected, shall be disconnected from its supply.

Requirement for disconnection of EV is defined in AC1 7.2.3.1 AC1.

Compliance check: under consideration.

Addition:

6.4.3.101 DC supply for EV

The d.c. EV charging station shall supply d.c. voltage and current to the vehicle battery in accordance with VCCF's controlling.

For regulated systems, the d.c. EV charging station shall supply regulated d.c. voltage or current (not simultaneously, but as requested by the vehicle during charging) to the vehicle battery in accordance with VCCF's controlling. Requirements for charging performance of regulated d.c. current / voltage are given in 101.2.1.1, 101.2.1.2 and 101.2.1.3 and 101.2.1.4.

In either case mentioned above, the maximum ratings of the d.c EV charging station shall not be exceeded.

The vehicle can change the requested current and/or requested voltage.

6.4.3.102 Measuring current and voltage

The d.c. EV charging station shall measure the output current and output voltage. The accuracy of output measurement is defined for each system in Annexes AA, BB and CC.

6.4.3.103 Retaining/releasing coupler

A means shall be provided to retain and release the vehicle coupler. Such means may be mechanical, electrical interlock, or combination of interlock and latch.

6.4.3.104 Locking of the coupler

A vehicle connector used for d.c. charging shall be locked on a vehicle inlet if the voltage is higher than 60 V d.c.

The vehicle connector shall not be unlocked (if the locking mechanism is engaged) when hazardous voltage is detected through charging process including after the end of charging. In case of charging system malfunction, a means for safe disconnection may be provided.

NOTE 1 The actuation portion of the locking function can be in either the vehicle connector or the vehicle inlet. It is configuration dependent.

The d.c. EV charging station shall have the following functions in case the locking is done by the d.c. EV charging station:

- electrical or mechanical locking function to retain the locked status, and
- function to detect the disconnection of the electrical circuits for the locking function.

NOTE 2 The locking function for each system is defined in Annexes AA, BB and CC.

NOTE 3 An example of lock function and disconnection detection circuit is shown in Annex AA.

For the tests of mechanical strength, refer to IEC 62196-3.

6.4.3.105 Compatibility assessment

Compatibility of EV and d.c. EV charging station shall be checked with the information exchanged at the initialization phase as specified in 102.5.1.

6.4.3.106 Insulation test before charging

The d.c. EV charging station shall confirm the insulation resistance between its d.c. output circuit and protective conductor to the vehicle chassis, including the charging station enclosure, before the EV contactors are allowed to close.

If the required value is not met, the d.c. EV charging station shall send the signal to the vehicle that the charging is not allowed.

Conformance is determined by measuring the insulation resistance as follows:

Any relays in the d.c. output circuit of the d.c. EV charging station shall be closed during the test.

The required value of insulation resistance R shall be as shown in Formula (1):

$$R \geq 100 \, \Omega/V \times U \quad (1)$$

where

U is rated output voltage of the d.c. EV charging station.

6.4.3.107 Protection against overvoltage at the battery

The d.c. EV charging station shall perform an emergency shutdown and disconnect its supply to prevent overvoltage at the battery, if output voltage exceeds maximum voltage limit sent by the vehicle. In case of vehicle failure, disconnection from a.c. mains may not be necessary.

Specific requirement for detection and shutdown are defined in Annexes AA, BB and CC.

The vehicle can change the maximum voltage limit during charging process.

Compliance is checked according to the following test.

The d.c. EV charging station is connected to a d.c. voltage source or artificial load.

The voltage of the d.c. voltage source or artificial load should be within the operating range of the charging station.

The d.c. EV charging station is set to charge the d.c. voltage source at a current of more than 10 % of the maximum rated current of d.c. EV charging station.

A maximum voltage limit command lower than the voltage of the voltage source shall be sent to the d.c. EV charging station.

Both the time between when the command is sent and the beginning of charging current reduction, and the rate of reduction shall be measured.

The voltage of the voltage source, the way the command voltage limit is sent and the value of the voltage limit $\langle AC_1 \rangle$ may $\langle AC_1 \rangle$ be chosen freely to comply with this test.

NOTE The selection of charging current can be made by the system or the user.

6.4.3.108 Verification of vehicle connector voltage

This clause is only applicable for charging stations which are responsible for locking of vehicle connector, such as system A and system B.

The d.c. EV charging station shall not energize the charging cable when the vehicle connector is unlocked. The voltage at which the vehicle connector unlocks shall be lower than 60 V.

6.4.3.109 Control circuit supply integrity

If an earth fault, short circuit or overcurrent is detected in output circuit of d.c. EV charging station, the power circuit shall be disconnected from its supply, but the power supply for control circuit shall not be interrupted unless the power circuit interruption is due to a loss of a.c. supply network (mains).

6.4.3.110 Short circuit test before charging

With the EV connected to the d.c. EV charging station and before the EV contactor is closed, the d.c. EV charging station shall have a means to check for a short circuit between d.c. output circuit positive and negative for the cable and vehicle coupler.

Compliance test specifications are defined in Annexes AA, BB and CC (under consideration).

6.4.3.111 User initiated shutdown

The d.c. EV charging station shall have a means to allow the user to shut down the charging process.

6.4.3.112 Overload protection for parallel conductors (conditional function)

If more than one conductor or wire and/or vehicle connector contact is used in parallel for d.c. current supply to the vehicle, the d.c. EV charging station shall have a mean to ensure, that none of the conductors or wires will be overloaded.

NOTE For example, the currents on the different paths can be monitored or more than one power source can be used.

6.4.3.113 Protection against temporary overvoltage

For stations serving a maximum output voltage up to 500 V, no voltage higher than 550 V shall occur for more than 5 s at the output between DC+ and PE or between DC- and PE.

For stations serving a maximum output voltage above 500 V and up to 1 000 V, no voltage higher than 110 % of d.c. output voltage shall occur for more than 5 s at the output between DC+ and PE or between DC- and PE. See Figure 101.

For voltage above 1 000 V: under consideration.

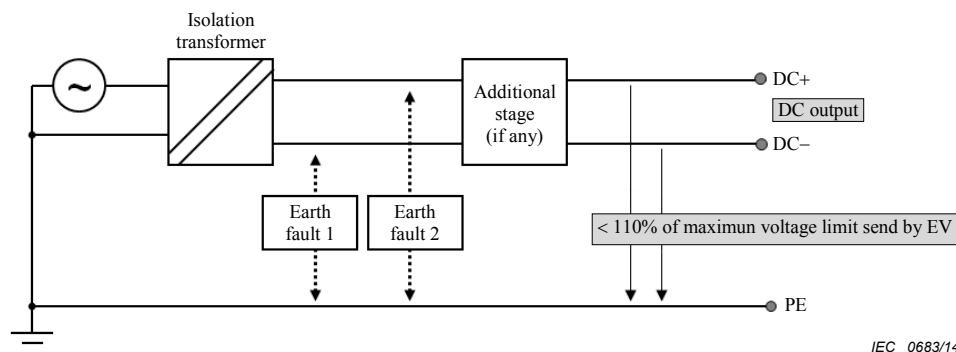
The d.c. EV charging station shall terminate the supply of charging current and disconnect the d.c. power circuit from its supply within 5 s, to remove the source of overvoltage (see 5.3.3.2.3 in IEC 60664-1:2007). This shall also apply in case of a first earth fault within the isolated output part of the d.c. EV charging station.

For U_n , as the minimum DC charger output voltage, the d.c. EV charging station shall limit the voltage between DC+/- and PE at:

$$(2 U_n + 1\,000) \times 1,41 \text{ V or;}$$

$$(U_n + 1\,200) \times 1,41 \text{ V, whichever is less.}$$

NOTE The voltage can be limited by reducing the overvoltage category or by adding a surge protection device with sufficient clamping voltage.



IEC 0683/14

Figure 101 – Overvoltage protection in case of earth fault

6.4.3.114 Emergency shutdown

When the d.c. EV charging station detects an abnormality in the station and/or the vehicle, the safety shall be ensured by the emergency shutdown as follows.

Stop charging by:

- controlled expedited interruption of charging current or voltage to the vehicle, where d.c. current descends with a controlled slope, and appropriate signaling to the vehicle, or
- uncontrolled abrupt termination of charging under specific fault conditions, where there is no control of current, and the vehicle may not be informed in time.

NOTE The d.c. EV charging station can achieve this requirement by exchange of information with the vehicle (see 102.4 and Annex AA, BB or CC).

Under specific conditions, the following disconnection, for example, is required according to the risk assessment of the abnormality in the station or the vehicle:

- disconnection of the supply to the conductor in which an earth leakage is detected;

- disconnection of the conductor in which an overcurrent is detected;
- disconnection of the d.c. power circuit from the supply if an insulation failure is detected.

General procedure of shutdown in the charging control process is given in 102.5.3.

6.4.4 Detail of optional function

6.4.4.3 Retaining/releasing of the coupler

Not applicable

6.4.4.5 Details of optional functions for mode 3

Not applicable.

Addition:

6.4.4.101 Wake up of d.c. EV charging station by EV

The charging station may support a standby mode to minimize power consumption. In this case, the station shall be able to be woken up by the EV.

6.4.5 Details of pilot function

Replacement:

For d.c. charging, control pilot function is mandatory. The control pilot function shall be capable of performing at least the mandatory functions described in 6.4.3.1, 6.4.3.2, 6.4.3.3 and 6.4.3.4, and may also be capable of contributing to optional functions described in 6.4.4.

Addition:

6.101 Classification

DC EV charging stations and systems may be classified as follows.

6.101.1 Category

6.101.1.1 According to system structure:

- isolated d.c. EV charging station, according to the type of insulation between input and output:
 - a) basic insulation,
 - b) reinforced insulation,
 - c) double insulation,
- non-isolated d.c. EV charging station.

6.101.1.2 According to system control:

- regulated d.c. EV charging station:
 - a) controlled current charging,
 - b) controlled voltage charging,
 - c) combination of a) and b),
- non-regulated d.c. EV charging station.

6.101.1.3 According to power receiving:

- d.c. EV charging station connected to a.c. mains;
- d.c. EV charging station connected to d.c. mains.

6.101.1.4 According to environmental conditions:

- outdoor use,
- indoor use.

NOTE 1 In some countries national regulations require ventilation for indoor charging: USA, Canada.

NOTE 2 DC EV charging stations classified for outdoor use can be used for indoor use, provided ventilation requirements are satisfied.

6.101.1.5 According to the system used:

- system A (see Annex AA),
- system B (see Annex BB),
- system C (see Annex CC).

6.101.2 Rating

According to d.c. output voltage:

- up to and including 60 V,
- over 60 V up to and including 1 500 V.

7 Protection against electric shock

This clause of Part 1 is applicable except as follows:

7.2.3.1 Disconnection of EV

Replacement of the 1st sentence:

One second after having disconnected the EV from the supply, the voltage between accessible conductive parts or any accessible conductive part and protective conductor shall be less than or equal to 60 V d.c., and the stored energy available shall be less than 20 J (see IEC 60950-1).

Replacement:

7.2.3.2 Disconnection of d.c. EV charging station

Conditions for the disconnections of the d.c. EV charging station from the supply mains are identical to those required for the disconnection of the EV as indicated in 7.2.3.1.

7.4 Supplementary measures

Not applicable except for the mobile d.c. EV charging station.

Replacement:

7.5 Protective measures for d.c. EV charging stations

The types of d.c. EV charging stations covered by these requirements, including all accessible conductive parts on the equipment shall have the following protective measures as described in IEC 61140.

- protective measures by automatic disconnection of supply by connecting all exposed-conductive-parts to a protective conductor during battery charging, unless protective measure by reinforced or double insulation or protective measure by electrical separation is used for the d.c. EV charging stations.

Addition:

7.5.101 Requirements of the isolated d.c. EV charging station

Requirements for the isolated d.c. EV charging station for protection against electric shock are defined for each system in AA.3.1, BB.2 or CC.4.1.

In addition, if the d.c. EV charging station has multiple d.c. outputs designed for simultaneous operation, each output circuit shall be isolated from each other by basic insulation or reinforced insulation.

NOTE 1 Requirements for multiple simultaneous outputs, which are non-isolated from each other, are under consideration.

[AC1] NOTE 2 In the following countries, both isolated and non-isolated electric vehicle supply equipment and d.c. EV charging stations comply with the requirements in national standards: US, CA. **[AC1]**

For multiple output, see IEC 60364-7-722¹.

7.5.102 Requirements of the non-isolated d.c. EV charging station

For non-isolated d.c. EV charging stations: under consideration.

[AC1] NOTE In the following countries, both isolated and non-isolated electric vehicle supply equipment and d.c. EV charging stations comply with the requirements in national standards: US, CA. **[AC1]**

7.5.103 Protective conductor dimension cross-sectional area

Protective conductor shall be of sufficient cross-sectional area to satisfy the requirements of IEC 60364-5-54.

NOTE In some countries, the size and rating of the protective conductor is specified in national codes and regulations.

7.6 Additional requirements

Replacement:

The d.c. EV charging station shall be compatible with RCD Type A in the installation, i.e. a.c. supply network (mains).

Class II chargers may have a lead- through protective conductor for earthing the EV chassis.

8 Connection between the power supply and the EV

This clause of Part 1 is applicable except as follows:

8.1 General

Replacement:

¹ To be published.

The physical conductive electrical interface requirements between the vehicle and the d.c. EV charging station are as defined in IEC 62196-3.

For non-isolated systems: under consideration.

8.2 Contact sequencing

Replacement

6.7 in IEC 62196-3:— is applicable.

8.3 Functional description of a standard interface

Not applicable.

8.4 Functional description of a basic interface

Not applicable.

Replacement:

9 Specific requirements for vehicle coupler

This clause of Part 1 is applicable except as follows:

9.1 General requirements

Replacement:

The construction and performance requirements of vehicle coupler are specified in IEC 62196-1.

The requirements for the d.c. interfaces are specified in IEC 62196-3.

Replacement:

9.3 Service life of vehicle coupler

The construction and performance requirements of vehicle coupler are specified in IEC 62196-1.

9.4 Breaking capacity

Replacement:

For d.c. charging, the vehicle couplers are rated "not for current interruption." A disconnection shall not take place under load.

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

Avoidance of breaking under load can be achieved by a specific means on the vehicle connector or a system with interlock.

In addition to locking mechanism defined in 6.4.3.104, in case of unintended disconnection of the vehicle coupler, the output current of the d.c. EV charging station shall be turned off within a defined time to contain a possible arc within the vehicle coupler housing. This turn off time

shall comply with the value specified in Annexes AA, BB and CC, using a speed of separation of the vehicle connector of $(0,8 \pm 0,1)$ m/s according to IEC 60309-1.

Disconnection of vehicle coupler can be detected when one of the following occurs:

- loss of digital communication;
- interruption of interlock circuit(s), e.g. control pilot, proximity circuit, to mitigate electrical arcing and shock hazards.

The system specific requirement for breaking capacity and system redundancy are defined in Annexes AA, BB and CC.

10 Charging cable assembly requirements

This clause of Part 1 is applicable except as follows:

10.1 Electrical rating

Replacement:

The rated voltage and current of each conductor shall correspond to the rated voltage and current of the d.c. output of the d.c. EV charging station.

11 EVSE requirements

This clause of Part 1 is applicable except as follows:

11.4 Dielectric withstand characteristics

11.4.2 Impulse dielectric withstand (1,2/50 μ s)

Replacement:

The dielectric withstand of the power circuits at impulse shall be checked using values as indicated in Table F.1 of IEC 60664-1:2007, category III for fixed d.c. EV charging stations, and category II for detachable d.c. EV charging stations. Lower overvoltage category can apply if appropriate overvoltage reduction specified in IEC 60664-1 is provided.

The test shall be carried out in accordance with the requirements of IEC 61180-1.

Addition:

11.4.101 Suppression of overvoltage category

The isolated d.c. EV charging station shall reduce overvoltage to the EV to the rated impulse voltage of 2 500 V.

Primary circuit of d.c. charging station in outdoor is overvoltage category (OVC) III according to Part 1.

NOTE The overvoltage reduction can be achieved by combination of one or more attenuation means in accordance with 4.3.3.6 of IEC 60664-1:2007.

11.5 Insulation resistance

Add the following sentence:

Insulation resistance according to 11.5 does not include components bridging insulation according to 1.5.6 and 1.5.7 of IEC 60950-1:2005, Amendment 1:2009, Amendment 2:2013.

NOTE The test is made without an insulation monitoring system.

11.6 Clearances and creepage distances

Replacement:

Clearance and creepage distances shall be in accordance with IEC 60664-1.

The minimum pollution degrees shall be as specified below:

- outdoor use: pollution degree 3,
- indoor use: pollution degree 2, except industrial areas: pollution degree 3.

The pollution degree of the micro environment for the d.c. EV charging station may be influenced by installation in an enclosure.

NOTE The macro environment for indoor use only is assumed to be a pollution degree of at least 2 for mild conditions.

11.7 Leakage-touch-current

Replacement:

This subclause defines the measurement of current through networks simulating the impedance of the human body (touch current).

Addition:

11.7.101 Touch-current limit

The touch current between any a.c. supply network poles and the accessible metal parts connected with each other and with a metal foil covering insulated external parts shall not exceed the values indicated in Table 2 of Part 1.

The test shall be made when the d.c. electric vehicle charging station is functioning with a resistive load at rated output power.

For Class I d.c. EV charging station, 11.7.106 is applicable, if the test touch current exceeds 3,5 mA.

Circuitry which is connected through a fixed resistance or referenced to protective conductor (for example, EV connection check) should be disconnected before this test.

11.7.102 Test configuration

Test configurations for measurement of leakage current are given in 5.4.1 of IEC 60990:1999.

11.7.103 Application of measuring network

The measuring network is defined in Figure 102. In Figure 102, terminal B of the measuring network is connected to the earthed (neutral) conductor of the supply. Terminal A of the measuring network is connected to each conductive or unearthed accessible surface in turn. All accessible conductive or unearthed surfaces are to be tested for touch currents. The measuring network of Figure 102 is from Figure 4 of IEC 60990:1999.