



DPC: 23 / 30451690 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

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Part 1: General requirements

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Responsible Committee Secretary: **Ms Andreea Vieru (BSI)**
Direct tel: **0208 996 7432**
E-mail: **andreea.vieru@bsigroup.com**

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.

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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.	



69/900/CD

COMMITTEE DRAFT (CD)

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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 23E, SC 23H, TC 64

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

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TITLE:

Electric vehicle conductive charging system - Part 1: General requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 1: General requirements

FOREWORD

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

A list of all parts of the IEC 61851 series, 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 website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,

- 359 • withdrawn,
- 360 • replaced by a revised edition, or
- 361 • amended.

362

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363

INTRODUCTION

This standard is the first part of the IEC 61851 series of standards that gives the general requirements for the supply¹ of electric energy to Electric road vehicles². It is to be noted that the vehicle and the EV supply equipment² make up a complete system that is covered by a number of IEC and ISO standards.

IEC 61851 covers the mechanical, electrical, communications, EMC and performance requirements for EV supply equipment used to charge electric vehicles, including light electric vehicles.

IEC 61851 is divided into several parts as follows:

- *Part 1: General Requirements*,
This document is a system standard that serves as a basis for all the subsequent standards in the series. It is the product standard for Mode 3 EV supply equipment.
 - *Part 21-1: Electric vehicle onboard charger EMC requirements for conductive connection to an AC/DC supply*. This part covers requirements for EMC onboard the vehicle.
 - *Part 21-2: EMC requirements for OFF board electric vehicle charging systems*. This part covers all requirements for AC and DC EV supply equipment. EMC requirements for wireless power transfer systems (WPT) are not included.
 - *Part 23: DC electric vehicle charging station (2014)*. This part covers the requirements for DC charging stations both permanently wired and cable and plug connected.
 - *Part 23-1: DC electric vehicle charging station with an automated connection device (under development)*
 - *Part 23-3: DC electric vehicle supply equipment for Megawatt charging systems (under development)*
 - *Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging (2014)*. This part provides the requirements for communication between the vehicle and the DC charging stations of Part 23.
 - *Part 25: DC EV supply equipment where protection relies on electrical separation*.
 - *Part 26: EV supply equipment with automated connection of a vehicle coupler located at the underbody of an electric vehicle (under development)*
 - *Part 27: EV supply equipment with automated connection of a vehicle coupler according to IEC 62196-2 or IEC 62196-3 (under development)*
- IEC 61851-3 subseries is under development and is intended to cover EV supply equipment with a DC output not exceeding 120 V where reinforced or double insulation or class III is used as the principal means of protection against electric shock (information on scope as available on 3/2016).
- *Part 3-1: Electric vehicles conductive power supply system – Part 3-1: General Requirements for EV supply equipment where protection relies on double or reinforced insulation – AC and DC conductive power supply systems*.
 - *Part 3-2: Electric vehicles conductive power supply system – Part 3-2: Particular requirements EV supply equipment where protection relies on double or reinforced insulation – Voltage converter unit*
 - *Part 3-3: Electric vehicles conductive power supply system – Part 3-3: Requirements for Light Electric Vehicles (LEV) battery swap systems*.

¹ The term "supply of electric energy" is used to designate energy flow to and from the electric vehicle. The term "charging" used in the title is also used to designate such energy flow.

² The reader is advised to refer to the definitions clause 3 for this and all subsequent terms that are used in this document.

- *Part 3-4: Electric vehicles conductive power supply system – Part 3-4: Particular requirements EV supply equipment where protection relies on double or reinforced insulation – General definitions and requirements for CANopen communications*
- *Part 3-5: Electric vehicles conductive power supply system – Part 3-5: Particular requirements EV supply equipment where protection relies on double or reinforced insulation – Pre-defined communication parameters and general application objects*
- *Part 3-6: Electric vehicles conductive power supply system – Part 3-6: Particular requirements for EV supply equipment where protection relies on double or reinforced insulation - Voltage converter and communication*
- *Part 3-7: Electric vehicles conductive power supply system – Part 3-7: Particular requirements for EV supply equipment where protection relies on double or reinforced insulation – Battery system communication*

Documents directly related to the present document:

- ISO 17409:2020, *Electrically propelled road vehicles – Connection to an external electric power supply – Safety requirements*.
This document gives requirements for electric vehicle that is to be connected to the EV supply equipment. It covers all the classes of vehicles that are in the scope of ISO/TC 22/SC 37.
- IEC 62752:2016, *In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)*.
This product standard gives the requirements for Mode 2 devices that include supplementary protective and control devices that allow the safe connection of a vehicle to a mains socket-outlet of an installation.
- ISO/IEC 15118 (all parts), *Road vehicles — Vehicle to grid communication interface*
This series of documents gives the description and the requirements for high level data communication between the EV and the EV supply equipment.

Requirements for wireless power transfer systems are given in IEC 61980 series.

ELECTRIC VEHICLE CONDUCTIVE CHARGING SYSTEM –

Part 1: General requirements

Secretary note : Countries are requested to confirm their respective notes by commenting this document, else they will be deleted in future document stage.

1 Scope

This part of IEC 61851 applies to EV supply equipment for charging electric road vehicles, with a rated supply voltage up to 1 000 V AC or up to 1 500 V DC, and a rated output voltage up to 1 000 V AC or up to 1 500 V DC.

This document also provides requirements for EV supply equipment enabling bi-directional power transfer (BPT), with reverse output voltage up to 1 000 V AC or 1 500 V DC.

Secretary note:: Requirements for BPT will be added at next document stage. The terms input and output will need further clarification

Electric road vehicles (EV) cover all road vehicles, including plug-in hybrid road vehicles (PHEV), that derive all or part of their energy from on-board rechargeable energy storage systems (RESS).

This standard also applies to EV supply equipment supplied from on-site storage systems (e.g. buffer batteries).

The aspects covered in this standard include:

- the characteristics and operating conditions of the EV supply equipment;
- the specification of the connection between the EV supply equipment and the EV;
- the requirements for electrical safety for the EV supply equipment.

Additional requirements may apply to equipment designed for specific environments or conditions, for example:

- EV supply equipment located in hazardous areas where flammable gas or vapour and/or combustible materials, fuels or other combustible, or explosive materials are present;
- EV supply equipment designed to be installed at an altitude of more than 2 000 m;
- EV supply equipment intended to be used on board on ships;

Requirements for electrical devices and components used in EV supply equipment are not included in this standard and are covered by their specific product standards.

EMC requirements for EV supply equipment are covered by IEC 61851-21-2.

Beside functional requirements given in clause 7 of this standard, all Mode 2 requirements are covered by IEC 62752.

This standard does not apply to:

- safety aspects related to maintenance;
- charging of trolley buses, rail vehicles, industrial trucks and vehicles designed primarily for use off-road;

- equipment on the EV;
- EMC requirements for equipment on the EV while connected, which are covered in IEC 61851-21-1;
- Charging RESS off board of the EV;
- DC EV supply equipment that relies specifically on double/reinforced insulation or class III protection against electric shock. See IEC 61851-23 or the future IEC 61851-3 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60038, *IEC standard voltages*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

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

IEC 60068-2-30, *Environmental testing –Part 2-30 : tests - Test Db : damp heat, cyclic (12h + 12 h cycle)*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60309-1, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*

IEC 60309-2, *Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories*

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

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

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

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60068-2-30, *Environmental testing –Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 12 h cycle)*

IEC 60884-1, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

IEC 60898 (all parts), *Circuit-breakers for overcurrent protection for household and similar installations*

IEC 60898-1, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

[Tapez ici]

- 512 IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*
- 513 IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors,*
514 *switch-disconnectors and fuse-combination units*
- 515 IEC 60947-4-1, *Low voltage switchgear and controlgear – Part 4-1: Contactors and motor-*
516 *starters – Electromechanical contactors and motor-starters*
- 517 IEC 60947-6-2, *Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment*
518 *– Control and protective switching devices (or equipment) (CPS)*
- 519 IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*
- 520 IEC 60990, *Methods of measurement of touch current and protective conductor current*
- 521 IEC 61008-1, *Residual current operated circuit-breakers without integral overcurrent protection*
522 *for household and similar uses (RCCBs) – Part 1: General rules*
- 523 IEC 61009-1, *Residual current operated circuit-breakers with integral overcurrent protection for*
524 *household and similar uses (RCBOs) – Part 1: General rules*
- 525 IEC 61180, *High-voltage test techniques for low-voltage equipment – Definitions, test and*
526 *procedure requirements, test equipment*
- 527 IEC 61316:1999, *Industrial cable reels*
- 528 IEC 61439-7:2022, *Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for*
529 *specific applications such as marinas, camping sites, market squares, electric vehicles charging*
530 *stations*
- 531 IEC 61643-11, *Low-voltage surge protective devices -Part 11: Surge protective devices connected to*
532 *low-voltage power systems -Requirements and test methods*
- 533 IEC 61643-21, *Low-voltage surge protective devices -Part 21: Surge protective devices connected to*
534 *telecommunications and signalling networks -Performance requirements and testing methods*
- 535 IEC 61643-41, *Low-voltage surge protective devices -Part 41: Surge protective devices connected to*
536 *low-voltage DC power systems -Requirements and test methods*
- 537 IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-*
538 *related systems*
- 539 IEC 61558-1, *Safety of power transformers, power supplies, reactors and similar products –*
540 *Part 1: General requirements and tests*
- 541 IEC 61558-2-4, *Safety of transformers, reactors, power supply units and similar products for*
542 *supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating*
543 *transformers and power supply units incorporating isolating transformers*
- 544 IEC 61810-1, *Electromechanical elementary relays – Part 1: General and safety requirements*
- 545 IEC 61851 (all parts), *Electric vehicle conductive charging system*
- 546 IEC 61851-23:2014, *Electric vehicle conductive charging system – Part 23: DC electric vehicle*
547 *charging station*

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 62196 (all parts), *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles*

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

IEC 62196-2:2016, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories*

IEC 62196-3:2014, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3: Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers*

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

IEC 62423, *Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses*

IEC 62752, *In-Cable Control and Protection Device for mode 2 charging of electric road vehicles (IC-CPD)*

IEC 62893-1, *Charging cables for electric vehicles - Part 1: General requirements (under development)*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Electric supply equipment

3.1.1

EV supply equipment

equipment or a combination of equipment, providing dedicated functions to supply electric energy from a fixed electrical installation or supply network to an EV for the purpose of power transfer.

EXAMPLE 1: For Mode 3 case B, the EV supply equipment consists of the EV charging station and the cable assembly.

EXAMPLE 2: For Mode 3 case C, the EV supply equipment consists of the EV charging station with its cable assembly.

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3.1.2**AC EV supply equipment**

EV supply equipment that supplies alternating current to an EV

3.1.3**DC EV supply equipment****3.1.4 EV supply equipment that supplies direct current to an EV****EV charging system**

complete system including the EV supply equipment and the EV functions that are required to supply electric energy to an EV for the purpose of charging

3.1.5**EV charging station**

stationary part of EV supply equipment connected to the supply network

Note 1 to entry: For case C, the cable assembly is part of the EV charging station.

3.1.6**charging**

all functions necessary to condition voltage and/or current provided by the AC or DC supply network to assure the supply of electric energy to the RESS

3.1.7**charging mode**

method for connection of an EV to the supply network to supply energy to the vehicle.

3.1.8**charging mode 1**

Mode 1 is a method for the connection of an EV to a standard socket-outlet of an AC supply network, utilizing a cable and plug, both of which are not fitted with any supplementary pilot or auxiliary contacts.

3.1.9**charging mode 2**

Mode 2 is a method for the connection of an EV to a standard socket-outlet of an AC supply network utilizing an AC EV supply equipment with a cable and plug, with a control pilot function and system for personal protection against electric shock placed between the standard plug and the EV.

3.1.10**charging mode 3**

Mode 3 is a method for the connection of an EV to an AC EV supply equipment permanently connected to an AC supply network, with a control pilot function that extends from the AC EV supply equipment to the EV.

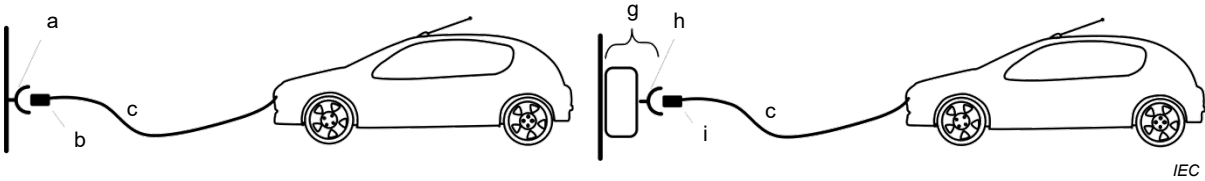
3.1.11**charging mode 4**

Mode 4 is a method for the connection of an EV to an AC or DC supply network utilizing a DC EV supply equipment, with a control pilot function that extends from the DC EV supply equipment to the EV.

3.1.12**case A**

connection of an EV to the supply network with a cable assembly permanently attached to the EV

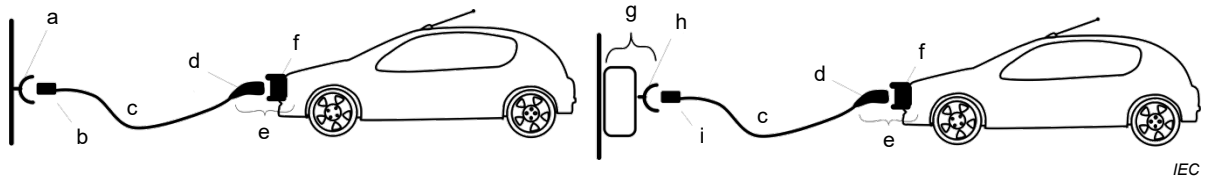
SEE: Figure 1



Note 1 to entry: The cable assembly is part of the vehicle.

Figure 1 – Case A connection

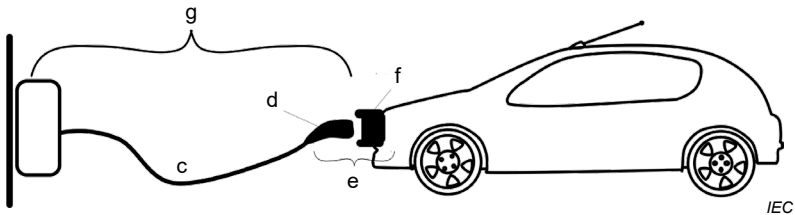
3.1.13
case B
connection of an EV to a supply network with a cable assembly detachable at both ends
SEE: Figure 2



Note 1 to entry: The detachable cable assembly is not part of the vehicle or the EV charging station.

Figure 2 – Case B connection

3.1.14
case C
connection of an EV to a supply network utilizing a cable assembly permanently attached to the EV charging station.
SEE: Figure 3



Note 1 to entry: The cable assembly is part of the EV charging station.

Figure 3 – Case C connection

- Key for Figures 1 to 3**
- (a) Socket-outlet
 - (b) Plug
 - (c) Cable
 - (d) Vehicle connector
 - (e) Vehicle coupler

- (f) Vehicle inlet
- (g) EV Charging station
- (h) EV socket-outlet
- (i) EV plug

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3.2 Insulation

3.2.1

basic insulation

insulation of hazardous-live-parts which provides basic protection

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

[SOURCE: IEC 60050-826:2004, 826-12-14]

3.2.2

direct contact

electrical contact of persons or animals with live parts

[SOURCE: IEC 60050-195:2021, 195-06-03]

3.2.3

double insulation

insulation comprising both basic insulation and supplementary insulation

[SOURCE: IEC 60050-826:2004, 826-12-16]

3.2.4

conductive part

part which can carry electric current

[SOURCE: IEC 60050-195:2021, 195-01-06]

3.2.5

exposed conductive part

conductive part of electrical equipment, which can be touched and which is not normally live, but which can become live when basic insulation fails

Note 1 to entry: A conductive part of electrical equipment which can only become live through contact with an exposed-conductive-part which has become live is not considered to be an exposed-conductive-part itself.

[SOURCE: IEC 60050-442:1998, 442-01-21]

3.2.6

hazardous-live-part

live part which, under certain conditions, can give a harmful electric shock

[SOURCE: IEC 60050-195:2021, 195-06-05]

3.2.7

fault protection

protection against electric shock under single-fault conditions

[SOURCE: IEC 60050-195:2021, 195-06-02]

3.2.8

insulation

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

Note 1 to entry: Examples of relevant properties are: resistance, breakdown voltage.

690 [SOURCE: IEC 60050-151:2001, 151-15-41, modified merged with IEC 60050-151:2001, 151-
691 15-42, modified]

692 **3.2.9**

693 **live part <in electrical installations and equipment>**

694 conductive part intended to be energized under normal operating conditions, including the
695 neutral conductor and mid-point conductor, but excluding the PEN conductor, PEM conductor
696 and PEL conductor

697 [SOURCE: IEC 60050-195:2021, 195-02-19]

698 **3.2.10**

699 **reinforced insulation**

700 insulation of hazardous-live-parts which provides a degree of protection against electric shock
701 equivalent to double insulation

702 Note 1 to entry: Reinforced insulation may comprise several layers which cannot be tested singly as basic insulation
703 or supplementary insulation.

704 [SOURCE: IEC 60050-195:2021, 195-06-09]

705 **3.2.11**

706 **supplementary insulation**

707 independent insulation applied in addition to basic insulation for fault protection

708 [SOURCE: IEC 60050-826:2004, 826-12-15]

709 **3.3 Functions**

710 **3.3.1**

711 **control pilot conductor**

712 conductor incorporated in a cable assembly, which, together with the protective conductor, is
713 part of the control pilot circuit

714 **3.3.2**

715 **control pilot circuit**

716 circuit designed for the transmission of signals or communication between the EV and the EV
717 supply equipment

718 Note 1 to entry: for Mode 2 it is between the EV and the ICCB or IC-CPD.

719 **3.3.3**

720 **control pilot function**

721 function used to monitor and control the interaction between the EV and the EV supply
722 equipment

723 **3.3.4**

724 **control pilot function controller**

725 **CPFC**

726 device in the EV supply equipment and the EV responsible for the control pilot function and the
727 generation of the PWM signal

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

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3.3.5**proximity function**

electrical or mechanical means to indicate the insertion state of the vehicle connector in the vehicle inlet of the EV and/or to indicate the insertion state of the EV plug in the EV socket-outlet of the EV charging station

3.4 Vehicle**3.4.1****electric vehicle****EV****(electric road vehicle)**

any vehicle propelled by an electric motor drawing current from an RESS, intended primarily for use on public roads

Note 1 to entry: In this standard, these terms refer only to those vehicles that can be charged from an external electrical source.

[SOURCE: ISO 17409]

3.4.2**plug in hybrid electric road vehicle****PHEV**

electric vehicle that can charge the rechargeable electrical energy storage device from an external electric source and also derives part of its energy from another on-board source

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

3.4.3**rechargeable energy storage system****RESS**

rechargeable system that stores energy for delivery of electric energy for the electric drive

EXAMPLE: battery, capacitor, flywheel

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

[SOURCE: ISO 6469:20XX, 3.xx]

3.5 Cords, cables and connection means**3.5.1****adaptor**

portable accessory constructed as an integral unit incorporating both a plug portion and one socket-outlet portion

[SOURCE: IEC 60050-442:1998, 442-03-19, modified]

3.5.2**adapter cord****3.5.3 assembly consisting of a flexible cable or cord fitted with a plug on the one end and a portable socket-outlet on the other end, and which do not match each other cable assembly**

assembly consisting of flexible cable or cord fitted with a standard plug or EV plug on the one end and/or a vehicle connector on the other end, and that is used to establish the connection between the EV and the supply network or an EV charging station

Note 1 to entry: A cable assembly can be detachable or be a part of the EV or the EV charging station.

772 Note 2 to entry: A cable assembly can include one or more cables, with or without a fixed jacket, which can be in a
773 flexible tube, conduit or wire way.

774 [SOURCE: IEC 62196-1:2014, 3.1, modified]

775 **3.5.4**

776 **cable management system**

777 one or more devices that are intended to protect a cable assembly from mechanical damage
778 and/or to facilitate its handling

779 EXAMPLE: Cable suspension device.

780 **3.5.5**

781 **cord extension set**

782 assembly consisting of a flexible cable or cord fitted with a plug on the one end and a portable
783 socket-outlet or connector on the other end, and which can match each other

784 Note 1 to entry: The cord is called an "adapter cord" when the plug and socket-outlet do not match.

785 Note 2 to entry: A Mode 1, Mode 2 or Mode 3 cable assembly is not considered as a cord extension set.

786 [SOURCE: IEC 60050-461:2008, 461-06-17, modified adding Note 2]

787 **3.5.6**

788 **in-cable control box**

789 **ICCB**

790 device incorporated in the Mode 2 cable assembly, which performs control functions and safety
791 functions

792 Note 1 to entry: The "ICCB" is called "function box" in IEC 62752.

793 Note 2 to entry: This note applies to the French language only.

794 **3.5.7**

795 **IC-CPD**

796 assembly of linked parts or components including cables, plug and vehicle connector for supplying
797 electric vehicles in charging mode 2, which performs control functions and safety functions

798 [SOURCE: IEC 62752:20xx, 3.3.3.2, modification Note deleted]

799 **3.5.8**

800 **EV socket-outlet**

801 specific socket-outlet intended to be used as part of EV supply equipment and defined in the
802 IEC 62196 series

803 **3.5.9**

804 **EV plug**

805 specific plug intended to be used as part of EV supply equipment and defined in the IEC 62196
806 series

807 **3.5.10**

808 **plug**

809 accessory having contacts designed to engage with the contacts of a socket-outlet, also
810 incorporating means for the electrical connection and mechanical retention of flexible cables or
811 cords

812 [SOURCE: IEC 60050-442:1998, 442-03-01, modified – The word "pins" has been replaced by
813 "contacts" in the definition.]

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3.5.11**socket-outlet**

accessory having socket-contacts designed to engage with the contacts of a plug and having terminals for the connection of cables or cords

[SOURCE: IEC 60050-442:1998, 442-03-02, modified – The word "pins" has been replaced by "contacts" in the definition.]

3.5.12**standard plug and socket-outlet**

plug and socket-outlet which meets the requirements of any IEC and/or any national standard that provides interchangeability by standard sheets, excluding the specific EV accessories as defined in the IEC 62196 series

Note 1 to entry: The IEC 60309-1, IEC 60309-2 and IEC 60884-1 and IEC TR 60083, define standard plugs and socket-outlets.

3.5.13**vehicle coupler****electric vehicle coupler**

means of enabling the connection at will of a flexible cable to an electric vehicle

Note 1 to entry: It consists of two parts: a vehicle connector and a vehicle inlet.

[SOURCE: IEC 62196-1:2014, 3.3]

3.5.14**vehicle connector****electric vehicle connector**

part of a vehicle coupler integral with, or intended to be attached to the cable assembly

[SOURCE: IEC 62196-1:2014, 3.3.1]

3.5.15**vehicle inlet****electric vehicle inlet**

part of a vehicle coupler incorporated in, or fixed to, the electric vehicle

[SOURCE: IEC 62196-1:2014, 3.3.2]

3.5.16**connecting point**

terminating point in the fixed installation where energy is transferred to/from one electric vehicle

EXAMPLE A socket-outlet, a vehicle connector or a wireless power transfer device.

Note 1 to entry: The connecting point may be part of the fixed installed EV supply equipment.

Note 2 to entry: The connecting point for Modes 1 and 2 is the point where one electric vehicle is connected to the fixed installation or supply network.

Note 3 to entry: The connecting point for Modes 3 and 4 is the point where one electric vehicle is connected to the EV charging station

Note 4 to entry: The connecting point for Mode 1, Mode 2 and Mode 4, connected by a cable and plug is the standard socket-outlet.

Note 5 to entry: The connecting point for Mode 3 and permanently connected Mode 4 is the EV socket-outlet (case A and case B) or the EV connector (case C).

Note 6 to entry: EV supply equipment can have one or more connecting points to supply energy to EVs.

857 [SOURCE : IEC 60364-7-722:2018, 722.3.2, modified adding Notes for 2 to 5]

858 **3.5.17**
859 **interlock**

860 device that prevents the power contacts of a EV socket-outlet/vehicle connector from becoming
861 live before it is in proper engagement with a EV plug/vehicle inlet, and which either prevents
862 the EV plug/vehicle connector from being withdrawn while its power contacts are live or makes
863 the power contacts dead before separation

864 [SOURCE: IEC 62196-1:2022, 3.23]

865 **3.5.18**
866 **retaining means**

867 device (e.g. mechanical or electromechanical) that holds an EV plug or vehicle connector in
868 position when it is in proper engagement, and prevents its unintentional withdrawal

869 [SOURCE: IEC 62196-1:2022, 3.41]

870 **3.5.19**
871 **latching device**

872 part of the interlock mechanism provided to hold an EV plug in the EV socket-outlet or to hold
873 a vehicle connector in the vehicle inlet and to prevent its intentional or unintentional withdrawal

874 EXAMPLE See standard sheets 2-II and 2-IIId in IEC 62196-2:2022 and 3-IIId in IEC 62196-3:2022.

875 [SOURCE: IEC 62196-1:2022, 3.25]

876 **3.5.20**
877 **locking mechanism**

878 means intended to reduce the likelihood of tampering with, or an unauthorised removal, of the
879 accessories

880 [SOURCE: IEC 62196-1:2022, 3.28, modified – The note has been removed]

881 **3.5.21**
882 **vehicle adaptor**

883 portable accessories constructed as an integral unit incorporating both vehicle inlet portion and
884 vehicle connector portion

885 **3.5.22**
886 **vehicle adapter cord**

887 assembly consisting of a flexible cable or cord fitted with a vehicle inlet on the one end and a
888 vehicle connector on the other end, and which do not match each other

889 **3.5.23**
890 **low-voltage switchgear and controlgear assembly**

891 combination of one or more low-voltage switching devices together with associated control,
892 measuring, signalling, protective, regulating equipment, with all the internal electrical and
893 mechanical interconnections and structural parts, as defined by the original manufacturer,
894 which can be assembled in accordance with the original manufacturer's instructions

895 Note 1 to entry: Throughout this document, the term assembly is used for a low-voltage switchgear and controlgear
896 assembly

897 Note 2 to entry: The term "switching device" includes mechanical switching devices and semiconductor switching
898 devices, e.g. soft starters, semiconductor relays, frequency converters. The auxiliary circuits may also include
899 electro-mechanical devices e.g. control relays, terminal blocks, and electronic devices, e.g. electronic motor control

[Tapez ici]

900 devices, electronic measurement and protection devices, bus communication, programmable logic controller
901 systems.

902 [SOURCE: IEC 61439-1: 2021, 3.1.1]

903 **3.6 Service and usage**

904 **3.6.1**

905 **indoor use**

906 intended for operation under normal ambient conditions in a building

907 [SOURCE: IEC 60050-151:2001, 151-16-06, modified – The term “indoor” has been replaced
908 by “indoor use”.]

909 **3.6.2**

910 **outdoor use**

911 capable of operating under specific range of outdoor conditions

912 [SOURCE: IEC 60050-151:2001, 151-16-05, modified – The term “outdoor” has been replaced
913 by “outdoor use”.]

914 **3.6.3**

915 **portable equipment**

916 cord and plug connected equipment, cable assembly, adaptors or other accessories that are
917 capable to be carried by one person and designed and intended to be carried within the EV

918 **3.6.4**

919 **mobile equipment**

920 electric equipment which is moved while in operation or which can easily be moved from one
921 place to another while connected to the supply.

922 [SOURCE: IEC 60050-826:2004, 826-16-04]

923 **3.6.5**

924 **fixed equipment**

925 electric equipment fastened to a support or otherwise secured in a specific location

926 **3.6.6**

927 **stationary equipment**

928 fixed equipment or electric equipment not provided with a carrying handle and having such a
929 mass that it cannot easily be moved

930 Note 1 to entry: Stationary equipment is intended to be either permanently connected to the supply network or
931 connected to the supply network by a cable and plug.

932 [SOURCE: IEC 60050-826:2004, 826-16-06, modified]

933 **3.6.7**

934 **ground mounted**

935 equipment with a part intended to be embedded or attached to the ground

936 **3.6.8**

937 **permanently connected EV supply equipment**

938 EV supply equipment that can only be connected to, or disconnected from, the supply network
939 by the use of a tool

940 [SOURCE: IEC 60050-151: 2014, 151-11-29, modified equipment replaced by EV supply
941 equipment, electric power system replaced by supply network]

3.6.9

user

party who will specify, purchase, use and/or operate the assembly/equipment, or someone acting on their behalf

[SOURCE: IEC 61439-1:2021, 3.11, modified /equipment is added]

3.6.10

abnormal operating condition

temporary operating condition that is not a normal operating condition and is not a single fault condition of the equipment itself

Note 1 to entry: Abnormal operating conditions are specified in clause B.3 of IEC 62368-1:2023.

Note 2 to entry: An abnormal operating condition may be introduced by the equipment or by a person.

Note 3 to entry: An abnormal operating condition may result in a failure of a component, a device or a safeguard.

3.7 General terms

3.7.1

supply network

any source of electric energy (eg. Mains or electric grid, distributed energy resources (DER), battery bank, PV installation, generator, etc.)

3.7.2

protective conductor (identification : PE)

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

EXAMPLE Examples of a protective conductor include a protective bonding conductor, protective earthing conductor and an earthing conductor when used for protection against electric shock.

[SOURCE: IEC 60050-826:2004, 826-13-22, modified – The Note to entry 1 has been deleted.]

3.7.3

protective earthing conductor

protective grounding conductor (US, CA)

equipment grounding conductor (US, CA)

protective conductor provided for protective earthing

[SOURCE: IEC 60050-826:2004, 826-13-23]

3.7.4

earthing terminal

grounding terminal (US, CA)

terminal provided on equipment or on a device and intended for the electric connection with the earthing arrangement

[SOURCE: IEC 60050-195:1998, 195-02-31]

3.7.5

protective earthing

protective grounding (US, CA)

earthing a point or points in a system or in an installation or in equipment for purposes of electrical safety

[SOURCE: IEC 60050-195:1998/AMD1:2001, 195-01-11]

[Tapez ici]

3.7.6**residual current device****RCD**

mechanical switching device or association of devices designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions

Note 1 to entry: A residual current device can be a combination of various separate elements designed to detect and evaluate the residual current and to make and break current.

[SOURCE: IEC 60050-442:2019, 442-05-02]

3.7.7**leakage current**

electric current in an unintended conductive path under normal conditions

[SOURCE: IEC 60050-195:2021, 195-05-15]

3.7.8**switching device**

device designed to make or break the current in one or more electric circuits

[SOURCE: IEC 60050-441:1984, 441-14-01]]

3.7.9**mechanical switching device**

switching device designed to close and open one or more electric circuits by means of separable contacts

[SOURCE: IEC 60050-441:1984, 441-14-02, modified – The note has been removed.]

3.7.10**touch current**

electric current passing through a human body or through an animal body when it touches one or more accessible parts of an electrical installation or electrical equipment

[SOURCE : IEC 60050-826 :2004, 826-11-12]

3.7.11**Surge protective device (SPD)**

device that contains at least one non-linear component that is intended to limit surge voltages and divert surge currents

[SOURCE: IEC 61643-11:2011, 3.1.1, modified]

4 General requirements

The EV supply equipment shall be so constructed that an EV can be connected to the EV supply equipment so that in normal conditions of use, the energy transfer operates safely, and its performance is reliable and minimises the risk of danger to the user or surroundings.

Compliance is checked by meeting all of the relevant requirements of the IEC 61851 series.

Electric devices and components that are parts of EV supply equipment shall comply with their relevant standards.

1022 NOTE 1 In the following countries, there are other requirements to be met for EV supply equipment: JP, US,CA.

1023 **5 Service conditions**

1024 The service conditions defined in IEC 61439-7:2022, Clause 7 apply.

1025 The EV supply equipment shall be rated for one or more of standard nominal voltages and
1026 frequencies as given in IEC 60038.

1027 NOTE In the following countries, national standards or regulations provide different requirements for frequency: JP.

1028 **6 Classification**

1029 **6.1 According to the characteristics of power supply and output**

1030 **6.1.1 Characteristics of power supply input**

1031 The EV supply equipment shall be classified according to the supply network system that it is
1032 intended to be connected to:

- 1033 – EV supply equipment connected to AC supply network;
- 1034 – EV supply equipment connected to DC supply network.

1035 The EV supply equipment shall be classified according to the electric connection method:

- 1036 – Plug and cable connected;
- 1037 – Permanently connected.

1038 **6.1.2 Characteristics of power supply output**

1039 The EV supply equipment shall be classified according to the type of current the EV supply
1040 equipment delivers:

- 1041 – AC EV supply equipment;
- 1042 – DC EV supply equipment;
- 1043 – AC and/or DC EV supply equipment.

1044 **6.2 According to the service conditions**

1045 The EV supply equipment shall be classified according to the service conditions:

- 1046 – normal service conditions, indoor use;
- 1047 – normal service conditions, outdoor use.
- 1048 – special service conditions

1049 NOTE 1 The conditions that define indoor and outdoor use are given in [Clause 7](#) of IEC 61439-7:2022.

1050 NOTE 2 Specific requirements for the equipment related to installation environment, see IEC 60364-7-722.

1051 **6.3 According to the mounting method**

1052 The EV supply equipment shall be classified according to the type of mounting:

- 1053 a) stationary equipment;
- 1054 b) fixed equipment
 - 1055 – wall mounted
 - 1056 – pole -mounted

[Tapez ici]

- 1057 – floor mounted
- 1058 – ground mounted.
- 1059 c) non stationary equipment
- 1060 – transportable equipment;
- 1061 – mobile equipment.

1062 NOTE More than one classification can apply.

1063 **6.4 According to the mechanical resistance**

1064 The EV supply equipment shall be classified according to the mechanical resistance level :

- 1065 – medium resistance
- 1066 – high resistance

1067 **6.5 According to the charging mode**

1068 The EV supply equipment shall be classified according to 7.2:

- 1069 – Mode 1;
- 1070 – Mode 2;
- 1071 – Mode 3;
- 1072 – Mode 4.

1073 NOTE EV supply equipment with multiple outputs can be classified as supporting more than one mode.

1074 **7 Charging modes and functions**

1075 **7.1 General**

1076 Clause 7 describes the different charging modes and functions for energy transfer to EVs.

1077 **7.2 Charging modes**

1078 **7.2.1 Mode 1**

1079 The rated values for current and voltage shall not exceed:

- 1080 – 16 A and 250 V AC, single-phase,
- 1081 – 16 A and 480 V AC, three-phase.

1082 EV supply equipment intended for Mode 1 charging shall provide a protective earthing
1083 conductor from the standard plug to the vehicle connector.

1084 Current limitations are also subject to the standard socket-outlet ratings described in 8.7.4.2.

1085 NOTE 1 In the following countries, Mode 1 charging is prohibited by national codes: US, IL, UK

1086 NOTE 2 In the following countries, Mode 1 charging is prohibited in public areas by national codes: IT

1087 NOTE 3 In the following countries, Mode 1 charging without integral ground fault leakage interruption is not
1088 permitted: CA

1089 NOTE 4 In the following countries, plugs and socket-outlets according to IEC 60309-2 are recommended for Mode 1
1090 connections for more than 8 A (2 kVA): CH.

1091 NOTE 5 In the following countries, for EV supply equipment equipped with a plug for household and similar use,
1092 repeated continuous loads of long duration, shall be limited to 6 A: DK

1093 NOTE 6 In the following countries, EV supply equipment equipped with a plug for household and similar use, if the
1094 charging cycle can exceed 2 hours, the maximum rated current is 10 A: NO

1095 NOTE 7 In the following countries, NF C 61-314 applies to plug used for EV supply equipment: FR

1096 NOTE 8 In the following countries, Mode 1 cable assembly without PCRD shall not be used but only Mode 1 cables
1097 with a PCRD: DE

1098 – (Due to Article 14 in the constitutional law of Germany which frames the preservation of status quo of existing
1099 electrical installations it cannot be ensured that fixed electrical installations at all times provide an RCD in
1100 Germany).

1101 **7.2.2 Mode 2**

1102 The rated values for current and voltage shall not exceed:

- 1103 – 32 A and 250 V AC single-phase;
- 1104 – 32 A and 480 V AC three-phase.

1105 EV supply equipment intended for Mode 2 charging shall provide a protective earthing
1106 conductor from the standard plug to the vehicle connector.

1107 Mode 2 devices shall comply with IEC 62752 as product standard.

1108 **7.2.3 Mode 3**

1109 EV supply equipment intended for Mode 3 charging shall provide a protective earthing
1110 conductor to the EV socket-outlet and/or to the vehicle connector.

1111 NOTE In the following countries, the rated output current of the Mode 3 EV supply equipment is limited to 32 A for
1112 single phase and to 63 A for three phase : CN

1113 **7.2.4 Mode 4**

1114 Mode 4 equipment may be either permanently connected or connected by a cable and plug to
1115 the supply network.

1116 EV supply equipment intended for Mode 4 charging shall provide a protective earthing
1117 conductor or protective conductor to the vehicle connector.

1118 Additional requirements for DC EV supply equipment are given in IEC 61851-23.

1119 **7.3 Functions provided in Mode 2, 3 and 4**

1120 **7.3.1 Mandatory functions in Modes 2, 3, and 4**

1121 **7.3.1.1 General**

1122 The following control pilot functions shall be provided by the EV supply equipment:

- 1123 • Continuous continuity checking of the protective conductor according to clause 7.3.1.2;
- 1124 • Verification that the EV is properly connected to the EV supply equipment according to
1125 clause 7.3.1.3;
- 1126 • Energization of the power supply to the EV according to clause 7.3.1.4;
- 1127 • De-energization of the power supply to the EV according to clause 7.3.1.5;
- 1128 • Maximum allowable current according to clause 7.3.1.6.

1129 *Compliance is checked by inspection and test where applicable.*

[Tapez ici]

1130 If EV supply equipment can supply more than one vehicle simultaneously, it shall ensure that
1131 the control pilot function performs the above functions independently at each connecting point.

1132 NOTE The control pilot functions can be achieved using a PWM signal and a control pilot as described in Annex A
1133 or by any other non PWM system that provides the same results and is compatible with Annex A. An example is
1134 given in Annex D.

1135 EV supply equipment designed for Mode 2 or Mode 3, using the control pilot conductor and
1136 utilizing accessories according to IEC 62196-2, shall be provided with a control pilot function
1137 according to Annex A.

1138 Optionally, the EV supply equipment may be provided with a control pilot function in accordance
1139 with annex D (in addition to annex A).

1140 **7.3.1.2 Continuous continuity checking of the protective conductor**

1141 While charging in Mode 2, the electrical continuity of the protective earthing conductor between
1142 the ICCB and the respective EV contact shall be continuously monitored by the ICCB.

1143 While charging in Mode 3, the electrical continuity of the protective earthing conductor between
1144 the EV charging station and the respective EV contact shall be continuously monitored by the
1145 EV supply equipment.

1146 While charging in Mode 4, the electrical continuity of the protective conductor between the EV
1147 charging station and the respective EV contact shall be continuously monitored by the EV
1148 supply equipment.

1149 The EV supply equipment shall disconnect the supply to the EV in case of :

- 1150 • loss of electrical continuity of the protective conductor or interruption of the control pilot
1151 circuit, within 100 ms.
- 1152 • incapacity to verify the continuity of the protective conductor (e.g. short circuit between
1153 control pilot conductor and protective conductor), within 3 s.

1154 **7.3.1.3 Verification that the EV is properly connected to the EV supply equipment**

1155 The EV supply equipment shall be able to determine that the EV is properly connected to the
1156 EV supply equipment.

1157 Proper connection is assumed when the continuity of the control pilot circuit is detected.

1158 **7.3.1.4 Energization of the power supply to the EV**

1159 The EV socket-outlet or the vehicle connector shall not be energized unless the control pilot
1160 function between EV supply equipment and EV has been established correctly with signal states
1161 allowing energization.

1162 The presence of such states does not imply that energy will be transferred between the EV
1163 supply equipment and the EV as this may be subject to other external conditions, e.g. energy
1164 management system.

1165 If the EV requests ventilation, the EV supply equipment shall only energize the system if such
1166 ventilation is provided by the installation or the premises.

1167 **7.3.1.5 De-energization of the power supply to the EV**

1168 If the control pilot signal is interrupted the power supply to the EV shall be interrupted according
1169 to clause 7.3.1.2.

1170 If the control pilot signal status no longer allows energization, the power supply to the EV shall
1171 be interrupted but the control pilot signalling may remain in operation.

1172 **7.3.1.6 Maximum allowable current**

1173 A means shall be provided to inform the EV of the value of the maximum current it is allowed
1174 to draw. The value of the maximum current permitted shall be transmitted and shall not exceed
1175 any of the following:

- 1176 • the rated output current of the EV supply equipment,
- 1177 • the rated current of the cable assembly.

1178 The transmitted value may change, without exceeding the maximum allowed current, to adapt
1179 to power limitations, e.g. for load management.

1180 The EV supply equipment may interrupt the energy supply if the current drawn by the EV
1181 exceeds the transmitted value.

1182 **7.3.2 Optional functions for Modes 2, 3 and 4**

1183 **7.3.2.1 General**

1184 The optional functions that are implemented shall be indicated in the manual and shall fulfil the
1185 requirements of clause 7.3.2.

1186 Other functions can be provided.

1187 *Compliance is checked by inspection and test where applicable.*

1188 **7.3.2.2 Ventilation during supply of energy for Mode 3 and Mode 4 EV supply** 1189 **equipment**

1190 The Mode 3 and Mode 4 EV supply equipment can exchange information with installation
1191 regarding the request and presence for ventilation.

1192 NOTE 1 Ventilation requirements might be subject to local or national regulation or standard.

1193 NOTE 2 In the following countries national regulations may require ventilation for some situations for indoor
1194 charging under certain conditions: CA, US

1195 NOTE 3 This is mainly a requirement for indoor charging.

1196 **7.3.2.3 Intentional and unintentional unmating of the vehicle connector and/or the** 1197 **EV plug for Mode 2, Mode 3 and Mode 4 EV supply equipment**

1198 The EV supply equipment shall provide mechanical or electromechanical means to prevent
1199 intentional and unintentional unmating under load of the vehicle connector and/or EV plug
1200 according to IEC 62196-1 when these accessories are classified as not suitable for making and
1201 breaking an electrical circuit under load.

1202 NOTE 1 IEC 62196-1:2014 defines three levels of prevention of unmating as given in the definitions 3.9, 3.10 and
1203 3.11 in the order of increasing constraints, as follows:

- 1204 – Unintentional unmating prevention -> retaining means,
- 1205 – Unintentional and intentional unmating prevention -> latching device,
- 1206 – Unintentional, intentional unmating and tampering prevention -> locking mechanism.

1207 NOTE 2 In the following countries a means to prevent unintentional unmating of the EV accessories is required:
1208 CA, US.

[Tapez ici]

7.3.2.4 EV supply equipment using a vehicle connector for AC and DC power transfer on the same contacts

The combined charging system as described in Annex CC of IEC 61851-23:2014 and ISO 17409 shall be so designed that:

- AC chargeable EVs with a basic vehicle inlet do not require any means to protect the EV against DC voltage at the inlet.
- AC EV supply equipment does not require any means to be self-protected against DC voltage coming from the EV.

NOTE 1 Standard Sheets for configuration EE and FF of IEC 62196-3 gives dimensions, rating and relevant mechanical functions of the interfaces EE and FF for DC. EV charging system C is described in Annex CC of IEC 61851-23:2014.

For DC charging, digital communication shall be established between the vehicle and the DC EV supply equipment that validates the DC energy transfer. The DC supply to the vehicle shall not be connected until such complete validation from the vehicle is achieved.

A combined interface extends the use of a basic interface for AC and DC charging.

DC charging can be achieved by using separate and additional DC power contacts to supply DC energy to the EV or by using power contacts placed at the position of the AC power contacts of a basic interface, if the vehicle connector and the vehicle inlet are both suitable for DC.

The basic portion of the combined vehicle inlet can be used with a basic connector for AC charging only or with a combined connector having separate contacts for AC or DC charging.

AC and DC power transfer shall not occur through the combined interface at the same time.

The combined interface used for DC charging shall only be used with the “Combined Charging System” described in Annex CC of IEC 61851-23:2014.

Analysis and design of the EV supply equipment using a basic interface for DC shall apply a risk analysis according to IEC 61508 (all parts) applying a severity level of at least S2 for the function preventing the risk of unintended DC voltage output.

NOTE 2 Such analysis includes the effect of vehicle faults on EV supply equipment.

7.3.2.5 Load balancing for Mode 2 and Mode 3 EV supply equipment

The load balancing function consists in limiting the power unbalance between phases.

NOTE In some countries, DSOs require a limitation of the power unbalance between phases.

This function can be achieved by different methods:

- a) by a permanent limitation of the maximum allowable current communicated by the EV supply equipment to the EV. This permanent limitation can prevent the exceedance the unbalance limit, whatever the number of phases used by the EV. If this permanent limitation is achieved by configuration of the EV supply equipment, the means for configuration are made by the use of a key or a tool and are only accessible to skilled or instructed persons.

Or

- d) by a dynamic limitation of the maximum allowable current communicated by the EV supply equipment to the EV. This dynamic limitation can be achieved:

- In standalone mode, the EV supply equipment detects the current drawn by the EV on each phase and limits the eventual unbalance by adjusting the maximum allowable current communicated to the EV.

- 1251 • In conjunction with an external energy management system, which detects the
- 1252 unbalance level and provides the relevant information to the EV supply equipment which
- 1253 adjusts the maximum allowable current communicated to the EV.

1254 **7.3.2.6 Communications**

1255 **7.3.2.6.1 Digital communication between the EV supply equipment and the EV**

1256 Digital communication is optional for Modes 1, 2 and 3.

1257 For Mode 4 the digital communication as described in IEC 61851-24 shall be provided to allow

1258 the EV to control the EV supply equipment.

1259 NOTE 1 Digital communication as described in ISO/IEC 15118 series is also called high level communication.

1260 NOTE 2 Annex D also provides information on digital communication.

1261 **7.3.2.6.2 Digital communication between the EV supply equipment and the**

1262 **management system**

1263 Digital communication between the EV supply equipment and the management system is optional.

1264 **8 Constructional requirements for Mode 3 and Mode 4 EV supply equipment**

1265 **8.1 Strength of materials and parts**

1266 **8.1.1 General**

1267 Clause 8.1.1 of IEC 61439-7:2022 applies.

1268 **8.1.2 Protection against corrosion**

1269 Clause 8.1.2 of IEC 61439-7:2022 applies.

1270 **8.1.3 Damp heat resistance**

1271 The EV supply equipment shall pass the test defined in clause 11.1.2

1272 **8.1.4 Properties of insulating materials**

1273 Clause 8.1.3 of IEC 61439-7:2022 applies.

1274 **8.1.5 Resistance to UV radiation**

1275 Clause 8.1.4 of IEC 61439-7:2022 applies.

1276 **8.1.6 Lifting provisions**

1277 Clause 8.1.6 of IEC 61439-7:2022 applies.

1278 **8.2 Degree of protection and mechanical strength provided by an EV supply**

1279 **equipment assembly enclosure**

1280 **8.2.1 Protection against mechanical impact**

1281 Clause 8.1.5 of IEC 61439-7:2022 applies with the following additions.

1282 EV supply equipment shall comply with the severity levels defined in Table 1 and according to

1283 the level declared by the manufacturer.

[Tapez ici]

1284

Table 1 – Mechanical requirements and tests for EV supply equipment

Name of the test	Test standard clause	Medium resistance (for normal exposure)			High resistance (for severe exposure)		
		fixed equipment: wall mounted	stationary equipment or fixed equipment: ground, floor, pole mounted	mobile or transportable equipment	fixed equipment: wall mounted	stationary equipment or fixed equipment: ground, floor, pole mounted	mobile or transportable equipment
Mechanical impact	IEC 61439-7 : 2022 clause 10.2.701.2	At least IK08			IK 08 if height higher than 0.9 m, or IK10	At least IK10	At least IK10
Static load	IEC 61439-7 : 2022 clause 10.2.701.3	NO	Vertical load 4500 N/m ²	NO	NO	Vertical load 8500 N/m ²	NO
		NO	Lateral force 600 N	NO	NO	Lateral force 1200 N	NO
Strength of the doors	IEC 61439-7 : 2022 clause 10.2.701.4	A load of 50 N + load increased to 250 N	A load of 50 N + load increased to 250 N	A load of 50 N + load increased to 250 N	A load of 50 N + load increased to 450 N	A load of 50 N + load increased to 450 N	A load of 50 N + load increased to 450 N
Shock load	IEC 61439-7 : 2022 clause 10.2.701.5	NO	NO	NO	NO	Total mass of 15 kg	NO
Torsionnal test	IEC 61439-7 : 2022 clause 10.2.701.6	NO	NO	NO	NO	2 × 1 000 N applied for 30 s	NO
Shock test	IEC 61439-7 : 2022 clause 10.2.701.7	NO	NO	YES	NO	NO	YES
NOTE 1 : The choice between medium resistance and high resistance to be installed will depend on several factors : national rules, accessibility of the EV supply equipment after installation, mechanical protection in the surroundings of the EV supply equipment, etc. NOTE 2 : These requirements are based on medium and high resistance levels defined in 8.2.1.701, 8.2.1.702 and Table 702 of IEC 61439-7:2022. NOTE 3 : Higher resistance can be also required by national installation rules.							

1285 *Compliance is checked by the relevant tests defined in clause 11.1.3.*

1286 **8.2.2 Protection against contact with live parts, ingress of solid foreign bodies and**

1287 **water (IP code)**

1288 **8.2.2.1 Degrees of protection against solid foreign objects and water for the**

1289 **enclosures**

1290 After installation in accordance with the manufacturer's instructions, enclosures of the EV

1291 supply equipment shall have an IP degree, according to IEC 60529 as follows:

- 1292 • indoor use: at least IP41;
- 1293 • outdoor use: at least IP44.

1294 *Compliance is checked according to clause 11.1.4.*

1295 **8.2.2.2 Degrees of protection against solid foreign objects and water for basic,**
1296 **universal and combined and DC interfaces**

1297 The minimum IP degree for EV socket-outlets and the vehicle connectors shall be in accordance
1298 with their appropriate standards.

1299 The minimum IP degrees for ingress of objects and liquids shall be:

- 1300 • Indoor use:
 - 1301 – vehicle connector when mated with vehicle inlet: IP21;
 - 1302 – EV plug mated with EV socket-outlet: IP21;
 - 1303 – vehicle connector for case C when not mated: IP21;
 - 1304 – vehicle connector for case B when not mated: IP24.
- 1305 • Outdoor use:
 - 1306 – vehicle connector when mated with vehicle inlet: IP44;
 - 1307 – EV plug mated with EV socket-outlet: IP44;
 - 1308 – vehicle connector when not mated: IP24;
 - 1309 – vehicle connector for case B when not mated: IP24;
 - 1310 – EV socket-outlet when not mated: IP24.

1311 IPX4 may be obtained by the combination of the EV socket-outlet or vehicle connector and the
1312 lid or cap, EV supply equipment enclosure or EV enclosure.

1313 *Compliance is checked according to clause 11.1.4.*

1314 NOTE In the following countries, the UL articulated finger probe is used according to national regulations: US, CA.

1315 **8.2.3 EV supply equipment with removable parts**

1316 Clause 8.2.3 of IEC 61439-7:2022 applies.

1317 **8.2.4 Assemblies with water and other fluid systems**

1318 This clause does not apply to a liquid cooled cable assembly according to IEC 62196-3:2025 or
1319 IEC TS 62196-3-1.

1320 Clause 8.701.2 of IEC 61439-7:2022 applies.

1321 **8.3 Clearances and creepage distances**

1322 The clearances and creepage distances in the EV supply equipment, installed as intended by
1323 the manufacturer, shall be in accordance with the requirements specified in IEC 60664 series.

1324 Parts of the EV supply equipment directly connected to the public AC supply network shall be
1325 designed according to overvoltage category IV.

1326 Permanently connected EV supply equipment shall be designed according to a minimum
1327 overvoltage category III except for the EV socket-outlet or the vehicle connector where a
1328 minimum overvoltage category II applies.

1329 Parts or components not complying with these overvoltage categories shall be protected within
1330 the EV supply equipment by appropriate means according to clause 8.7.3.1, in order to
1331 attenuate the transient overvoltage levels.

[Tapez ici]

1332 NOTE For this purpose, it is not sufficient to provide means in the upstream installations

1333 Compliance is checked by verification of clearances and creepage distances according to IEC
1334 60664 series. Verification is done by design verification or measurement of the distances on
1335 the product. See clause 6.8 of IEC 60664-1:2020.

1336 **8.4 Temperature rise**

1337 Clause 9.2 of IEC 61439-7:2022 applies.

1338 NOTE 1 For equipment used above 2000 m, the cooling effects at the higher altitude can be different and should be
1339 considered.

1340 NOTE 2 In the following countries, verification of the temperature rise includes measurements for electrical
1341 components, wiring terminals and systems, electrical insulation and materials, conductor and cable insulation and
1342 other parts are verified by type test according to National Standards: US

1343 NOTE 3 In the following countries, the EV supply equipment and its circuits shall be able to carry their maximum
1344 rated currents continuously under specified conditions, see IEC 61439-7, with a reference ambient air temperature
1345 of 25 °C, with adaptation of the temperature rise limits so that the sum of the ambient temperature and the individual
1346 temperature rise limit remains the same: US

1347 **8.5 Operation at low temperatures**

1348 The EV supply equipment shall be operational at low temperatures.

1349 Compliance is checked by tests according to clause 11.1.5.

1350 **8.6 Resistance to abnormal operating and fault conditions**

1351 The EV supply equipment shall be designed in such a way that a single fault condition or
1352 component failure does not lead to a hazard, unless other means to prevent the hazard are
1353 provided by the installation and are described in the installation manual provided with the EV
1354 supply equipment, see clause 10.1. The requirements in 8.6 also apply to abnormal operating
1355 conditions as applicable.

1356 Protection against the risk of thermal, electric shock and energy hazards in the case of fault
1357 condition of EV supply equipment may be evaluated based on circuit analysis provided by the
1358 manufacturer to identify critical components.

1359 If such analysis is conducted, it shall include situations where a single fault condition in any
1360 component, basic protection, fault protection or port would result in:

- 1361 • an impact on the voltage of accessible SELV and PELV circuits and accessible conductive
1362 parts, or
- 1363 • a risk of degradation due to emission of flame, burning particles, molten metal or fire
1364 according to clause 4.6 of IEC 62477-1:2022.

1365 The analysis and testing shall include the effect of short-circuit and open-circuit conditions of
1366 the component. Testing is necessary unless analysis can conclusively show that no hazard will
1367 result from failure of the component. Compliance shall be checked by test of clause 11.1.6.3.

1368 The effect of other identified abnormal operating condition and single fault condition shall be
1369 tested according to the applicable test in clause 11.1.6.

1370 The evaluation of components shall be based on the expected stress occurring in the life cycle
1371 of the EV supply equipment including the service conditions according to clause 5.

1372 Components evaluated according to relevant product standards as listed in Table 2 are
1373 considered to meet these requirements and do not need any further investigation, if tested
1374 under conditions that fulfill the conditions for which the EV supply equipment is designed.

1375 Clearance and creepage distances for supplementary insulation, double insulation and
1376 reinforced insulation, designed according to clause 8.3, are considered to meet these
1377 requirements and do not need any further investigation.

1378 Functional insulation on printed wiring boards (PWB) and between legs of components
1379 assembled on PWBs not fulfilling the requirements for clearance and creepage distance in
1380 clause 4.4.7.4 and clause 4.4.7.5 of IEC 62477-1:2023 shall meet the requirement of clause
1381 4.4.7.7 of IEC 62477-1:2023.

1382 Consideration shall be given to potential safety hazards associated with major component parts
1383 of the EV supply equipment, such as flammability of transformer and capacitor fluids, when they
1384 do not comply with the product standard listed in Table 2 or are used outside the specified limits
1385 of their standard.

1386 Circuits may be omitted from tests by risk analysis, if they are not connected to the mains supply
1387 and stay under the limits for limited power sources as defined in clause 4.6.5 of IEC 62477-
1388 1:2022.

1389 The number of tests can be decreased in case the likelihood of ignition of fire or fire spread has
1390 been reduced according to the risk analysis.

1391 Components bridging functional insulation may be omitted from testing.

1392 **Table 2 – Components excluded from simulated single fault condition tests**

Components	IEC standard
Resistors	IEC 62368-1 Annex G.10 ^a
Varistors	IEC 62368-1 Annex G.8 ^a
Inductors	IEC 60938 or IEC 62368 Annex ...
Capacitors	IEC 60384-14
Optocouplers	IEC 60747-5-5
Transformers	IEC 61558 series
Relays	IEC 61810-1
Contactors	IEC 60947-4-1
RCDs	IEC 61008 or IEC 61009,
RDC-DD	IEC 62955
MCBs	IEC 60898 series, IEC 60947-2
IMD	IEC 61557-8
SPDs	IEC 61643-11
Standard plug or standard socket-outlet	IEC 60884-1 or IEC 60309 series
EV socket-outlet or vehicle connector	IEC 62196 series
^a or equivalent based on e.g. IEC 62477-1 or IEC 61010-1	

1393

1394 **8.7 Incorporation of components**

1395 **8.7.1 General**

1396 Clause 8.5 (excluding 8.5.7 to 8.5.9) of IEC 61439-7:2022 applies with the following additions.

[Tapez ici]

1397 **8.7.2 Characteristics of switching devices**

1398 **8.7.2.1 General**

1399 Switching devices within EV supply equipment intended to supply the connecting points shall
1400 comply with clauses 8.7.2.2 and 8.7.2.3..

1401 **8.7.2.2 Types of switching devices**

1402 **8.7.2.2.1 Switch and switch-disconnector**

1403 Switches and switch-disconnectors shall comply with IEC 60947-3.

1404 For AC applications, switches and switch-disconnectors shall have a rated current, at a
1405 utilization category of at least AC-22A, not less than the rated current of the circuit that they
1406 are intended to operate in.

1407 For DC applications, switches and switch-disconnectors shall have a rated current, at a
1408 utilization category of at least DC-21A, not less than the rated current of the circuit that they
1409 are intended to operate in.

1410 *Compliance is checked by inspection.*

1411 NOTE In the following countries, national standards or regulations provide different requirements: JP.

1412 **8.7.2.2.2 Contactor**

1413 Contactors shall comply with IEC 60947-4-1.

1414 For AC applications, contactors shall have a rated current, at a utilization category of at least
1415 AC-1, not less than the rated current of the circuit that they are intended to operate in.

1416 For DC applications, contactors shall have a rated current, at a utilization category of at least
1417 DC-1, not less than the rated current of the circuit that they are intended to operate in.

1418 *Compliance is checked by inspection.*

1419 NOTE In the following countries, national standards or regulations provide different requirements: JP.

1420 **8.7.2.2.3 Circuit-breaker**

1421 Circuit breakers, if any, shall comply with IEC 60898-1 or IEC 60947-2 or IEC 61009-1.

1422 *Compliance is checked by inspection.*

1423 NOTE In the following countries, national standards or regulations provide different requirements: JP.

1424 **8.7.2.2.4 Relays**

1425 Relays used to switch the main current path shall comply with IEC 61810-1 with the following
1426 minimum characteristics:

- 1427 • 50 000 cycles,
- 1428 • contact category: CC 2.

1429 **8.7.2.3 Additional characteristics**

1430 **8.7.2.3.1 Inrush current**

1431 AC EV supply equipment shall withstand the inrush current according to 8.2.2 of
1432 ISO 17409:2020.

1433 NOTE The following values are specified in ISO 17409:

1434 After closing the contactor in the EV supply equipment at the peak value of the supply voltage, the EV supply
1435 equipment shall be able to withstand 230 A peak within the duration of 100 µs.

1436 During the next second the EV supply equipment shall be able to withstand 30 A (rms).

1437 *Compliance is determined by test on the complete EV supply equipment in accordance with*
1438 *clause 9.8 of IEC 62752:2016 or on the individual switching device according to Annex CC of*
1439 *IEC 61439-7:2022.*

1440 The protection means shall be selected not to trip for inrush current.

1441 **8.7.3 Protective devices**

1442 **8.7.3.1 Surge protection devices**

1443 If surge protective devices (SPD) are implemented in the EV supply equipment, these SPDs
1444 shall comply with the respective product standard, i.e., IEC 61643-11 for AC SPDs, IEC 61643-
1445 21 for data lines (if applicable) or IEC 61643-41 (under consideration) for DC SPDs.

1446 NOTE: SPDs might be implemented in the EV supply equipment e.g., for the purpose of protection of parts of the EV
1447 supply equipment against transient overvoltages according to IEC 60664-1, or to design the EV supply equipment
1448 for specific environmental conditions with respect to transient overvoltages of atmospheric origin.

1449 **8.7.4 Conductive electrical interface requirements**

1450 **8.7.4.1 General**

1451 Clause 8.7.4 provides a description of the conductive electrical interface requirements.

1452 **8.7.4.2 Functional description of standard accessories**

1453 Standard accessories used for EV supply equipment shall be in accordance with IEC 60309-1,
1454 IEC 60309-2 or IEC 60884-1 or the national standard. Standard accessories that are
1455 intermateable with interfaces described in the IEC 60320 series shall not be used for EV supply
1456 equipment.

1457 *Compliance is checked by inspection.*

1458 NOTE 1 In the following countries, IEC 60884-1, IEC 60884-2-5 and all other parts of the IEC 60884 series of
1459 standards are not indispensable and not applicable. National standards apply to plugs and socket-outlets for
1460 household use: UK.

1461 Socket-outlets and plugs designed for household and similar use might not be designed for
1462 extended current draw or continuous use at maximum rated currents and might be subject to
1463 national regulations and standards for supply of energy to an EV.

1464 NOTE 2 In the following countries the branch circuit overcurrent protection is based on 125 % of the rated current:
1465 US, CA.

1466 NOTE 3 In the following countries, specific requirements may apply for the use of such accessories for EV energy
1467 supply: US.

[Tapez ici]

1468 NOTE 4 In the following countries NF C 61-314 applies to plug and socket-outlets used for EV supply equipment:
1469 FR.

1470 NOTE 5 In the following countries, EV supply equipment equipped with a plug for household and similar use, if the
1471 charging cycle can exceed 2 hours, the maximum rated current is 10 A: NO.

1472 NOTE 6 In the following countries, for EV supply equipment equipped with a plug for household and similar use,
1473 repeated continuous loads of long duration, shall be limited to 6 A: DK.

1474 NOTE 7 In the following countries, plugs and socket-outlets, according to IEC 60309-2 are recommended for Mode
1475 1 and Mode 2 connections for more than 8 A (2 kVA): CH.

1476 NOTE 8 In the following country, 20 A socket-outlet is recommended for AC 200 V: JP.

1477 **8.7.4.3 Functional description of the basic interface**

1478 General requirements and ratings shall be in accordance with the requirements specified in
1479 IEC 62196-1.

1480 The basic interface is specified in 6.2, Table 201 and Table 202 of IEC 62196-2:2022.

1481 The following contacts are indicated:

- 1482 • up to three phases (L1, L2, L3);
- 1483 • neutral (N);
- 1484 • protective conductor (PE);
- 1485 • control pilot (CP);
- 1486 • proximity contact (PP).

1487 NOTE Proximity contact (PP) also known as CC (connection confirmation) in CN.

1488 It may be used either for single-phase or for three-phase or both.

1489 Ratings and requirements for the use of the basic interface shall be in accordance with the
1490 requirements specified in IEC 62196-2.

1491 **8.7.4.4 Functional description of the universal interface**

1492 General requirements and ratings shall be in accordance with the requirements specified in
1493 IEC 62196-1.

1494 The universal interface is specified in 6.4 and Table 2 of IEC 62196-1:2014.

1495 **8.7.4.5 Functional description of the DC interface**

1496 General requirements and ratings shall be in accordance with the requirements specified in
1497 IEC 62196-1.

1498 The DC interface, configurations and ratings are specified in 6.6 and Table 4 of IEC 62196-
1499 1:2014.

1500 Ratings and requirements for the use of DC interface shall be in accordance with the
1501 requirements specified in IEC 62196-3.

1502 **8.7.4.6 Functional description of the combined interface**

1503 The combined interface is specified in 6.7 and Table 5 of IEC 62196-1:2014.

1504 General requirements and ratings shall be in accordance with the requirements specified in
1505 IEC 62196-1.

1506 Ratings and requirements for the use of the combined interface with alternating current shall
1507 be in accordance with the requirements specified in IEC 62196-2.

1508 Ratings and requirements for the use of the combined interface with direct current shall be in
1509 accordance with the requirements specified in IEC 62196-3.

1510 **8.7.4.7 Wiring of the neutral conductor**

1511 Where accessories according to IEC 62196 are used for three phase supply the neutral
1512 conductor shall always be wired to the accessories.

1513 Where accessories according to IEC 62196 are used for single phase supply, the terminals L
1514 (L1) and N (Neutral) shall always be wired.

1515 *Compliance is checked by inspection.*

1516 NOTE In the following countries certain AC supply networks do not provide a neutral conductor: US, BE, IT, CA,
1517 JP, CH, NO.

1518 Wiring instructions shall be provided in the manual (see 16.1).

1519 **8.7.5 Cable assembly requirements**

1520 **8.7.5.1 General**

1521 The cable assembly shall be provided with a cable that is suitable for the application.

1522 NOTE IEC 62893 (under consideration) is a standard for some types of cables for the EV supply equipment.

1523 Cable assemblies shall not allow transitions from one mode to another.

1524 **8.7.5.2 Electrical rating**

1525 For case C, the voltage and current ratings of the cable assembly shall be compatible with the
1526 rating of the EV supply equipment.

1527 For accessories requiring current coding according to Annex B and IEC 62196-2, the maximum
1528 value of the current coding as indicated in Clause B.2 shall be in accordance with the current
1529 rating of the cable assembly.

1530 Cables used with accessories according to IEC 62196-2 for Mode 3 case B, shall have a
1531 minimum withstand I^2t value of 75 000 A²s.

1532 *Compliance is checked by inspection.*

1533 NOTE 1 In following countries, specific cable types for cable assemblies are required by national regulations: US
1534 (type cable EV, EVJ families), JP (VCT, etc.).

1535 NOTE 2 The I^2t value can be evaluated according to 434.5.2 of IEC 60364-4-43:2008.

1536 **8.7.5.3 Dielectric withstand characteristics**

1537 Dielectric withstand characteristics of the cable assembly shall be as indicated for the EV supply
1538 equipment in clause 9.2.9.

1539 **8.7.5.4 Construction requirements**

1540 A cable assembly shall be so constructed that it cannot be used as a cord extension set.

[Tapez ici]

1541 NOTE As in IEC 62196-1, EV plugs and vehicle connectors are designed not to match each other.

1542 A cable assembly may include one or more cables, which may be in a flexible tube, conduit or
1543 wire way.

1544 A cable assembly to the EV shall have conductors with cross-sectional areas according to the
1545 IEC 62196 series.

1546 The cable may be fitted with an earth-connected metal shielding.

1547 The cable insulation shall be wear resistant and maintain flexibility over the full temperature
1548 range required by the classification of the EV supply equipment.

1549 *Compliance is checked by inspection.*

1550 **8.7.5.5 Cable dimensions**

1551 The maximum cable length shall be in accordance with the national codes if any.

1552 NOTE 1 In the following countries, the overall length of the EV supply cable does not exceed 7,5 m unless equipped
1553 with a cable management system as required by national codes and regulations: US.

1554 NOTE 2 In the following countries, the overall length of the EV supply cable does not exceed 5 m unless equipped
1555 with a cable management system as required by national codes and regulations: CH.

1556 *Compliance is checked by inspection.*

1557 **8.7.5.6 Strain relief**

1558 The strain relief of the cable in the vehicle connector, EV plug or in the standard plug shall be
1559 as specified in the relevant product standard (e.g. IEC 62196-1, IEC 60309-1 or IEC 60884-1).

1560 For case C the strain relief at the EV supply equipment shall be in accordance with the
1561 requirements in IEC 62196-1.

1562 **8.7.5.7 Cable management and storage means for cables assemblies**

1563 For case C EV supply equipment, a storage means shall be provided for the vehicle connector
1564 when not in use.

1565 For case C EV supply equipment the lowest point of the vehicle connector when stored shall be
1566 located at a height between 0,5 m and 1,5 m above ground level.

1567 NOTE 1 In the following countries, requirements related to people with disabilities are covered by national
1568 regulations: US.

1569 NOTE 2 In the following countries, the vehicle connector when stored shall be located at a specific height for
1570 general public installations and for accessible public installations : ES.

1571 For case C EV charging stations with cables of more than 7,5 m, a cable management system shall be
1572 provided. The free cable length shall not exceed 7,5 m when not in use.

1573 Prevention of overheating of cables or cable assemblies used in stored or partially stored
1574 position shall be ensured.

1575 *Compliance is checked according to Clause 22 of IEC 61316:1999 for cable reel storage.*

1576 **8.7.6 Requirements for adaptors**

1577 Vehicle adaptors used to connect a vehicle connector to a vehicle inlet are under consideration

1578 Adaptors between the EV socket-outlet and the EV plug shall only be used if specifically
1579 designated and approved by the vehicle manufacturer or by the EV supply equipment
1580 manufacturer and in accordance with national requirements, if any (see 10.2).

1581 Such adaptors shall comply with the requirements of this standard, and the other relevant
1582 standards governing either the EV plug or EV socket-outlet portions of the adaptor. The
1583 adaptors shall be marked to indicate the specific conditions of use allowed by the manufacturer,
1584 e.g. IEC 62196 series.

1585 Such adaptors shall not allow transitions from one mode to another.

1586 NOTE 1 In the following countries, the use of adaptors from standard socket-outlets to Mode 3 vehicle cable
1587 assembly, that maintain the overall safety requirements of this standard is allowed: IT, SE, BE, CH.

1588 NOTE 2 In the following countries, the use of adaptors from standard socket-outlets to cable assembly with a basic
1589 or universal interface that maintains the overall safety requirements of this standard is allowed: FR, IT.

1590 NOTE 3 In the following countries, for Mode 1 and Mode 2, a short cord extension set of less than 30 cm in length
1591 and with a standard plug and no Mode change, is permitted for use on the EV supply equipment: SE.

1592 NOTE 4 In the following countries, the use of adapter cable assembly with a plug according to IEC 60884 and a
1593 socket-outlet according to IEC 60309, with no Mode change, of less than 30 cm and an overcurrent protection of 8 A
1594 in the plug portion, is allowed: CH.

1595 **8.7.7 Emergency switching or disconnect equipment (optional)**

1596 Emergency switching or disconnect equipment shall be used either to disconnect the supply
1597 network from EV supply equipment or to disconnect the EV socket-outlet(s) or the cable
1598 assembly(ies) from the supply network.

1599 Such equipment shall be installed in accordance with national rules.

1600 Such equipment may be part of the supply network or the EV supply equipment.

1601 NOTE In the following countries emergency disconnecting means are provided in an accessible location for some
1602 EV supply equipment rated more than 60 A or more than 150 V to ground according to national rules: US, CA.

1603 **8.7.8 Isolating transformers**

1604 Isolating transformers (excluding safety isolating transformers used for signalling) shall comply
1605 with the requirements of IEC 61558-1 and IEC 61558-2-4.

1606 *Compliance is checked by inspection*

1607 **8.8 Internal electrical circuits and connections**

1608 Clause 8.6 of IEC 61439-7:2022 applies.

1609 **9 Specific constructional requirements for Mode 3 EV supply equipment**

1610 **9.1 General**

1611 For mode 3 EV supply equipment, clause 8 applies with the additions as implemented in clause 9.

1612 In case the EV supply equipment can supply more than one vehicle simultaneously,
1613 independent means for protection against electrical shock and protection against overcurrent
1614 for each connecting point shall be implemented.

1615 *Compliance is checked by inspection and measurement.*

[Tapez ici]

9.2 Protection against electric shock

9.2.1 General

The EV supply equipment shall be designed according to the provisions against electric shock, for basic protection, fault protection and additional protection as specified in Table 3.

Table 3 – Provisions for protection against electric shock for an EV supply equipment

Provisions for basic protection ^a	Provisions for fault protection	Provisions for additional protection ^d
Protection in absence of a fault	Protection in case of a fault	
– basic insulation between hazardous-live-parts and exposed-conductive-parts; – protective enclosures between hazardous-live-parts and exposed-conductive-parts that fulfil at least IPXXC; – vehicle connector when mated with vehicle inlet: IPXXD; – EV plug when mated with socket-outlet: IPXXD; – vehicle connector when not mated with vehicle inlet: IPXXB for modes 2,3,4 and IPXXD for mode 1; – EV plug when not mated with socket-outlet: IPXXB;	Class I portions: – Automatic disconnection of supply (IEC 61140, 5.3.6) ^b. Class II portions: – Double or reinforced insulation between hazardous-live-parts and exposed conductive parts. Basic insulation of switching device in new condition provided by air over monitored ^e, open contacts of the switching device (clause 8.7.2) for unmated vehicle connector or EV plug within a protective enclosure (IEC 61140, 5.2.2.2) and one of the following measures: - Switching device shall be able to switch the rated current after to applying a conditional rated short-circuit current of at least 3kA or as declared by the manufacturer. ^c - Means to operate another switching device providing isolating function after detection of welded contacts. - Shutters on live entry holes of the EV socket-outlet or vehicle connector for case C PELV circuits: – protective separation of the PELV system from all circuits other than SELV and PELV.	30 mA RCD (clause 9.2.3)
^a For each portion of the EV supply equipment, at least one of these provisions shall be implemented. ^b The Automatic disconnection of supply requires, according to IEC 61440:2016 clause 5.3.6, a protective-equipotential bonding system as specified in IEC 61140:2016 clause 5.3.3. The relevant maximum disconnection times can be derived from IEC 60364-4-41. ^c Compliance is checked by test according to Annex XX or according to the relevant product standard of the switching device, if the product standard has equivalent or more stringent requirements for short-circuit conditions. ^d For the EV supply equipment, all of these provisions shall be implemented. ^e Monitoring and reaction shall be done according to clause 9.2.2		

NOTE 1 In the following countries, IPXXB is required for Mode 1: JP, SE, CH, AT, DE, BE, FI

NOTE 2 In the following countries options a and b are only acceptable if both options are used together: NL, IT

NOTE 3 In the following countries the option b alone is not allowed: BE, CH

NOTE 4 In following countries socket-outlets are equipped with shutters where they are mandatory in residential and public locations: FR, UK

NOTE 5 In following countries standard socket-outlets are equipped with shutters where they are mandatory in residential and public locations: DK

NOTE 6 In the following countries, for installations in dwellings and for 16 A applications, Wiring Rules prescribe the use of socket-outlets with shutters: ES

NOTE 7 In the following countries national regulations require shutters or equivalent protection methods with equivalent safety levels. For example: installation heights, blocking objects against touch ability, interlocking, locking cover etc. SE

1633 NOTE 8 In the following countries the use of software controlled means cannot be used to control isolating devices:
1634 UK

1635 Secretary NOTE to NOTE 8 : does it mean that only options a and c are acceptable in UK ? Please amend the note
1636 if it is confirmed for better understanding.

1637 *Compliance is checked by inspection and measurement.*

1638 9.2.2 Handling of welded contacts

1639 Welding of the switching contacts shall be detected at least once after each charging session.

1640 In case of welded contacts are detected, the EV supply equipment shall both:

- 1641 • signal an error state to the EV;
- 1642 • alert the user to the error state through the HMI at the EV supply equipment according
1643 to clause 10.6.

1644 These above requirements do not apply in case an upstream protection device has tripped, so
1645 there is no power supply to the EV supply equipment control circuit.

1646 Note: Detecting undesirable voltage at output when the EV is connected could lead to incorrect
1647 detection of welded contacts.

1648 9.2.3 Residual current protective devices

1649 EV supply equipment can have one or more connecting points to supply energy to EVs.

1650 Where connecting points can be used simultaneously and are connected to a common input
1651 terminal of the EV supply equipment, they shall have individual protection incorporated in the
1652 EV supply equipment.

1653 If the EV supply equipment has more than one connecting point that cannot be used
1654 simultaneously then such connecting points can have common protection devices.

1655 EV supply equipment that includes an RCD and that does not use the protective measure of
1656 electrical separation shall comply with the following:

- 1657 • The connecting point of the EV supply equipment shall be protected by an RCD having a
1658 rated residual operating current not exceeding 30 mA;
- 1659 • RCD(s) protecting connecting points shall be at least type A;
- 1660 • RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1,
1661 IEC 60947-2 and IEC 62423;
- 1662 • RCDs shall disconnect all live conductors.

1663 NOTE 1 This applies to single-phase or three-phase connecting points.

1664 Where the EV supply equipment is equipped with an EV socket-outlet or vehicle connector for
1665 AC use in accordance with IEC 62196 (all parts), protective measures against DC fault current
1666 shall be taken. The appropriate measures, for each connection point, shall be:

- 1667 • the use of an RCD type B; or
- 1668 • the use of an RCD type A in conjunction with a residual direct current detecting device
1669 (RDC-DD) complying with IEC 62955; or
- 1670 • the use of an RCD type F in conjunction with a residual direct current detecting device (RDC-
1671 DD) complying with IEC 62955.

[Tapez ici]

1672 NOTE 2 The RCDs or the appropriate equipment that ensure the disconnection of the supply in case of DC fault
1673 can be provided inside the EV supply equipment, in the installation or in both places.

1674 NOTE 3 Selectivity can be maintained between the RCD protecting a connecting point and an RCD installed
1675 upstream when required for service purposes.

1676 NOTE 4 In the following countries, as the installations are equipped with RCD of Type AC, a means for the
1677 protection of fault current with a performance at least equal to Type A in addition to appropriate equipment that
1678 ensures the disconnection of the supply in case of DC fault current above 6 mA is provided by the EV supply
1679 equipment: JP.

1680 NOTE 5 In the following country, the use of a system of protection is required that is intended to interrupt the
1681 electric circuit to the load when:

- 1682 – a fault current to earth (ground) exceeds some predetermined value that is less than that required to operate
1683 the overcurrent protective device of the supply circuit,
- 1684 – the earthing (grounding) path becomes open circuited or becomes an excessively high impedance, or a path
1685 to earth (ground) is detected on an isolated (ungrounded) system: US, CA.

1686 NOTE 6 In the following countries the use of a RCD of type AC for EVs connected by Mode 1 to domestic
1687 installations is allowed: JP, SE, UK, CA.

1688 NOTE 7 In some countries, a device which measures leakage current using a frequency sensitive network and trips
1689 at predefined levels of leakage current up to 20 mA, based upon the frequency is required: US, CA.

1690 NOTE 8 A PRCD as described in IEC 61540 or IEC 62335, can be used to improve protection for connection to
1691 existing AC power supply networks in Mode 1.

1692 **9.2.4 Automatic reclosing of protective devices**

1693 The automatic or remote reclosing of protective devices after tripping in the EV supply
1694 equipment shall only be possible in case the EV socket-outlet is not mated to an EV plug. This
1695 shall be checked by the EV supply equipment.

1696 For automatic or remote reclosing automatic reclosing devices (ARDs) with an assessment
1697 means may be used. ARD, if used, shall comply with IEC 63024.

1698 The EV supply equipment may close the contactor during an automatic or remote reset cycle to
1699 establish conductivity between the protection device and the EV socket-outlet.

1700 By this procedure, the EV supply equipment can check the circuit up to the EV socket-outlet to
1701 be free of fault current.

1702 NOTE In the following countries automatic reclosing of protection means is not allowed: DK, UK, FR, CH.

1703 For case C the EV supply equipment shall not provide automatic or remote reclosing of
1704 protective devices.

1705 *Compliance is checked by inspection and test.*

1706 **9.2.5 Protective conductor**

1707 The protective earthing conductor and the protective conductor shall be of sufficient rating in
1708 accordance with requirements of IEC 60364-5-54.

1709 NOTE In the following countries, the size and rating of the protective earthing conductor are determined by national
1710 codes and regulations: CA, US, JP

1711 For Modes 3 EV supply equipment, protective earthing conductors shall not be switched.

1712 *Compliance is checked by inspection.*

9.2.6 Insulation resistance

The insulation resistance measured according to the testing procedure of clause 11.2.1 shall be:

- for a class I EV supply equipment: $R > 1 \text{ M}\Omega$;
- for a class II EV supply equipment: $R > 7 \text{ M}\Omega$.

NOTE In the following countries, requirement for class II equipment includes additional tests to verify the adequacy of the basic, supplementary and double/reinforced insulation systems during both normal and after fault conditions: US

9.2.7 Touch current

9.2.7.1 Touch current limits

The touch current between any AC supply network poles and the accessible metal parts connected with each other, and with a metal foil covering insulated external parts, is measured in accordance with IEC 60990 and shall not exceed the values indicated in Table 4.

Table 4 – Touch current limits

	Class I	Class II
Between any network poles and the accessible metal parts connected with each other and a metal foil covering insulated external parts	3,5 mA	0,25 mA
Between any network poles and the metal inaccessible parts normally non-activated (in the case of double insulation)	Not applicable	3,5 mA
Between inaccessible and accessible parts connected with each other and a metal foil covering insulated external parts (additional insulation)	Not applicable	0,5 mA

Compliance is checked by the test in clause 0.

9.2.8 Protections against hazards caused by stored energy

The voltage between power lines or power lines and protective earthing conductor, when measured at the input supply terminals of the EV supply equipment, shall be less than or equal to 60 V DC or the stored energy shall be less than or equal to 0,2 J within 5 seconds after loss of the supply voltage to permanently connected EV supply equipment.

Compliance is checked by inspection of the relevant circuit diagrams or by the test in clause 11.2.3.

9.2.9 Dielectric withstand voltage

The EV supply equipment shall pass the AC withstand voltage test defined in clause 11.2.4.

Impulse dielectric withstand tests according to clause 11.2.5 are only required if means have been used to reduce the overvoltage category III or IV of parts and components according to clause 8.3.

Voltage levels for impulse tests shall comply with requirements of clause 8.3.

9.2.10 Safety requirements for signalling circuits between the EV supply equipment and the EV

Any circuit for signalling, which extends beyond the EV supply equipment enclosure for connection with the EV (e.g. control pilot circuit), shall be extra low voltage (SELV or PELV) according to IEC 60364-4-41.

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