

BS EN 62196-1:2014



BSI Standards Publication

Plugs, socket-outlets, vehicle connectors and vehicle inlets — Conductive charging of electric vehicles

Part 1: General requirements

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National foreword

This British Standard is the UK implementation of EN 62196-1:2014. It is derived from IEC 62196-1:2014. It supersedes BS EN 62196-1:2012+A12:2014, which will be withdrawn on 29 September 2019.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags C C.

The UK participation in its preparation was entrusted by Technical Committee PEL/23, Electrical accessories, to Subcommittee PEL/23/4, Protected type plugs and sockets.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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EN 62196-1

November 2014

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English Version

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

Fiches, socles de prise de courant, prises mobiles de
véhicule et socles de connecteur de véhicule - Charge
conductive des véhicules électriques - Partie 1: Règles
générales
(CEI 62196-1:2014 , modifiée)

Stecker, Steckdosen, Fahrzeugkupplungen und
Fahrzeugstecker - Konduktives Laden von
Elektrofahrzeugen - Teil 1: Allgemeine Anforderungen
(IEC 62196-1:2014 , modifiziert)

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Foreword

The text of document 23H/302/FDIS, future edition 3 of IEC 62196-1, prepared by IEC/SC 23H "Plugs, socket-outlets and couplers for industrial and similar applications, and for electric vehicles" of IEC/TC 23 "Electrical accessories" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62196-1:2014.

A draft amendment, which covers common modifications to IEC 62196-1, was prepared by CLC/TC 23BX "Switches, boxes and enclosures for household and similar purposes, plugs and socket outlets for d.c. and for the charging of electrical vehicles including their connectors" and approved by CENELEC.

This document supersedes EN 62196-1:2012.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-10-06
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2019-10-06

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62196-1:2014 are prefixed "Z".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 62196-1:2014 was approved by CENELEC as a European Standard with agreed common modifications.

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

IEC 60068-2-75:1997	NOTE	Harmonized as EN 60068-2-75:1997 (not modified).
IEC 60309-1	NOTE	Harmonized as EN 60309-1.
IEC 60947-1	NOTE	Harmonized as EN 60947-1.
IEC 60999-1:1999	NOTE	Harmonized as EN 60999-1:2000 (not modified).
IEC 60999-2:2003	NOTE	Harmonized as EN 60999-2:2003 (not modified).
IEC 61008-1	NOTE	Harmonized as EN 61008-1.
IEC 61009-1	NOTE	Harmonized as EN 61009-1.
IEC 61300-2-4	NOTE	Harmonized as EN 61300-2-4.
IEC 61300-2-6	NOTE	Harmonized as EN 61300-2-6.
IEC 61300-2-7	NOTE	Harmonized as EN 61300-2-7.
IEC 62752	NOTE	Harmonized as EN 62752.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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

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

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-14	-	Environmental testing -- Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	-
IEC 60112	-	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	-
IEC 60227	series	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750	-	-
IEC 60228	2004	Conductors of insulated cables	EN 60228	2005
			+corrigendum May 2005	2005
IEC 60245-4	-	Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables		-
IEC 60269-1	-	Low-voltage fuses -- Part 1: General requirements	EN 60269-1	-
IEC 60269-2	-	Low-voltage fuses -- Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Examples of standardized systems of fuses A to K	HD 60269-2	-
IEC 60309-4 (mod)	2006	Plugs, socket-outlets and couplers for industrial purposes -- Part 4: Switched socket-outlets and connectors with or without interlock	EN 60309-4	2007
IEC 60449	-	Voltage bands for electrical installations of buildings	HD 193 S2	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
			+corrigendum May 1993	1993
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems -- Part 1: Principles, requirements and tests	EN 60664-1	2007

IEC 60664-3	-	Insulation coordination for equipment within low-voltage systems -- Part 3: Use of coating, potting or moulding for protection against pollution	EN 60664-3	-
IEC 60695-2-11	-	Fire hazard testing -- Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products (GWEPT)	EN 60695-2-11	-
IEC 60695-10-2	-	Fire hazard testing -- Part 10-2: Abnormal heat - Ball pressure test method	EN 60695-10-2	-
IEC 61851-1	2010	Electric vehicle conductive charging system -- Part 1: General requirements	EN 61851-1	2011
IEC 61851-23	2014	Electric vehicle conductive charging system -- Part 23: D.C. electric vehicle charging station	EN 61851-23	2014
ISO 1456	-	Metallic and other inorganic coatings - Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium	EN ISO 1456	-
ISO 2081	-	Metallic and other inorganic coatings - Electroplated coatings of zinc with supplementary treatments on iron or steel	EN ISO 2081	-
ISO 2093	-	Electroplated coatings of tin; Specification and test methods	-	-

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INTRODUCTION

IEC 61851-1 specifies electric vehicle conductive charging equipment.

The IEC 62196 series specifies the requirements for plugs, socket-outlets, vehicle connectors, vehicle inlets and cable assemblies as described in IEC 61851-1.

Some charging can be achieved by direct connection from an electric vehicle to common mains socket-outlets.

Some modes of charging require a dedicated supply and charging equipment incorporating control and communication circuits.

IEC 62196 covers the mechanical, electrical and performance requirements for dedicated plugs, socket outlets, vehicle connectors and vehicle inlets for interfacing between such dedicated charging equipment and the electric vehicle.

IEC 62196 is divided into several parts as follows:

- Part 1: General requirements, comprising clauses of a general character.
- Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories.
- Part 3¹: Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers.

¹ To be published

PLUGS, SOCKET-OUTLETS, VEHICLE CONNECTORS AND VEHICLE INLETS – CONDUCTIVE CHARGING OF ELECTRIC VEHICLES –

Part 1: General requirements

1 Scope

This part of IEC 62196 is applicable to plugs, socket-outlets, vehicle connectors, vehicle inlets and cable assemblies for electric vehicles, herein referred to as “accessories”, intended for use in conductive charging systems which incorporate control means, with a rated operating voltage not exceeding

- 690 V a.c. 50 Hz to 60 Hz, at a rated current not exceeding 250 A,
- 1 500 V d.c. at a rated current not exceeding 400 A.

These accessories are intended to be installed by instructed persons (IEC 60050-195:1998, IEC 60050-195/AMD1:2001, 195-04-02) or skilled persons (IEC 60050-195:1998, IEC 60050-195/AMD1:2001, 195-04-01) only.

These accessories and cable assemblies are intended to be used for circuits specified in IEC 61851-1 which operate at different voltages and frequencies and which may include extra-low voltage and communication signals.

These accessories and cable assemblies are to be used at an ambient temperature between –30 °C and +50 °C.

NOTE 1 In some countries, other requirements may apply.

NOTE 2 the following countries, –35 °C applies: SE.

These accessories are intended to be connected only to cables with copper or copper-alloy conductors.

The accessories covered by this part of IEC 62196 are for use in certain modes of charging electric vehicles. These modes are defined in IEC 61851-1. These definitions and a description of the types of connection (cases A, B and C), are described in IEC 61851-1:2010, 6.2 and 6.3.1.

NOTE 3 In the following countries, mode 1 will not be allowed: UK, US, CA, SG.

This part of IEC 62196 does not apply to those standardised accessories used in charging systems where the use of such accessories constructed to the requirements of other standards is permitted (e.g. in mode 1 and mode 2). Such standardized accessories may be used for those situations (mode and case) identified in IEC 61851-1.

This part of IEC 62196 may be used as a guide for accessories with a lesser number of contacts and lower ratings for use with light duty vehicles.

2 Normative references

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

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60245-4, *Rubber insulated cables of rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60269-1, *Low-voltage fuses – Part 1: General requirements*

IEC 60269-2, *Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorised persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to K*

IEC 60309-4:2006, *Plugs, socket-outlets and couplers for industrial purposes – Part 4: Switched socket-outlets and connectors with or without interlock*

IEC 60449, *Voltage bands for electrical installations of buildings*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

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

IEC 61851-23:2014, *Electric vehicle conductive charging system – Part 23: d.c. electric vehicle charging station*

ISO 1456, *Metallic and other inorganic coatings – Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium*

ISO 2081, *Metallic and other inorganic coatings – Electroplated coatings of zinc with supplementary treatments on iron or steel*

ISO 2093, *Electroplated coatings of tin – Specification and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61851-1:2010 as well as the following apply.

NOTE 1 Where the terms voltage and current are used, they imply r.m.s. values, unless otherwise specified.

NOTE 2 The application of accessories is shown in Figure 1.

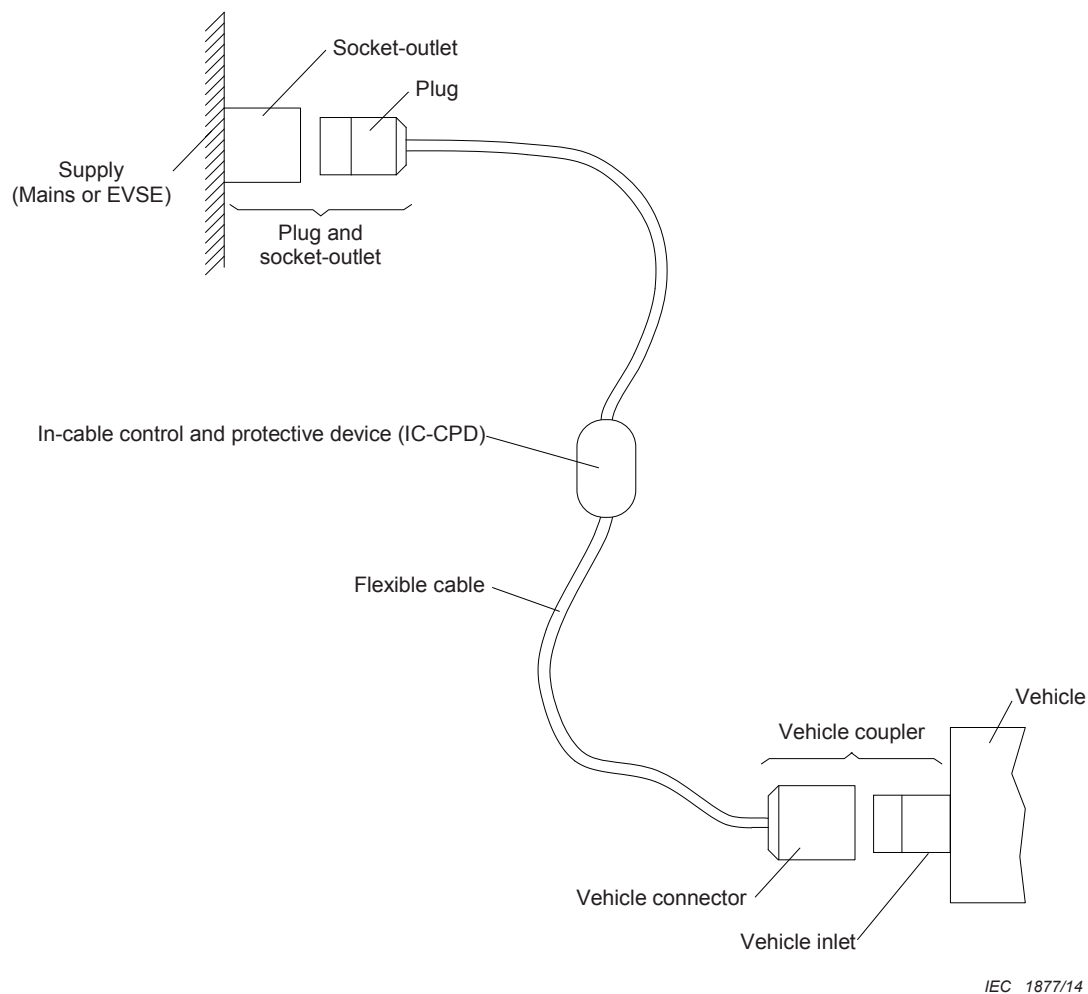


Figure 1 – Diagram showing the use of the accessories

3.1 cable assembly

piece of equipment that is used to establish the connection between the electric vehicle and the electric vehicle supply equipment

Note 1 to entry: A cable assembly may be either fixed to and included in one of these devices, or detachable. It includes the flexible cable, the vehicle connector and/or plug that are required for proper connection.

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

3.2 plug and socket-outlet

means enabling the connection at will of a flexible cable to fixed wiring

Note 1 to entry: It consists of two parts: a socket-outlet and a plug.

3.2.1**plug**

part of a plug and a socket-outlet integral with or intended to be attached to one flexible cable connected to the electric vehicle or to a vehicle connector

Note 1 to entry: It may include mechanical, electrical or electronic components and circuitry, which perform control functions.

3.2.2**socket-outlet**

part of a plug and a socket-outlet intended to be installed with the fixed wiring or incorporated in equipment

3.3**vehicle coupler****electric vehicle coupler**

means 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

3.3.1**vehicle connector****electric vehicle connector**

part of a vehicle coupler integral with, or intended to be attached to, one flexible cable

3.3.2**vehicle inlet****electric vehicle inlet**

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

3.4**shutter**

movable part incorporated into an accessory arranged to automatically shield at least the live contacts when the accessory is withdrawn from the complementary accessory

[SOURCE: IEC 60884-1:2002, IEC 60884-1/AMD2:2013, 3.27, modified – "socket-outlet" has been replaced by "accessory" in order to cover socket-outlets, plugs, vehicle connectors and vehicle inlets.]

3.5**insulated end cap**

part made of insulating material, located at the tip of a contact, ensuring a protection against access to hazardous parts with a standard test finger (IPXXB)

3.6**pilot contact**

auxiliary electric contact for use in a control, signalling, monitoring or interlock function

Note 1 to entry: Pilot contact is not considered to be a pole.

[SOURCE: IEC 60309-4:2006, 2.108, modified – "signalling" has been added.]

3.7**compatibility****compatible**

ability of accessories to join together and be functional

Note 1 to entry: Non-compatible accessories may physically join together, but not be functional.

3.8**interchangeability****interchangeable**

ability of an accessory to replace another, without any modification

Note 1 to entry: Interchangeable accessories generally have similar outer dimensions, fixing centres, etc.

3.9**retaining means**

device (e.g. mechanical or electromechanical) which holds a plug or vehicle connector in position when it is in proper engagement, and prevents its unintentional withdrawal

EXAMPLE See standard sheets in IEC 62196-2 and -3.

3.10**latching device**

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

EXAMPLE See standard sheets 2-II and 2-IIId in IEC 62196-2:2011 and 3-IIId in IEC 62196-3:2014.

3.11**locking mechanism**

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

EXAMPLE A provision for padlocking.

3.12**interlock**

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

3.13 Wiring**3.13.1****rewirable accessory**

accessory so constructed that the cable or wiring can be replaced; it can be either a user-serviceable accessory or a field-serviceable accessory

3.13.2**non-rewirable accessory**

accessory so constructed that the cable or wiring cannot be separated from the accessory without making it permanently useless

EXAMPLE A plug which is integrally moulded to the cable is an example of non-rewirable accessory.

3.13.3**user-serviceable accessory**

accessory so constructed that it can be rewired, or parts can be replaced, using commonly available tools and without having to replace individual parts of the accessory

EXAMPLE An ordinary plug, which can be disassembled and wired using a common screwdriver, is an example of user-serviceable accessory.

3.13.4**field-serviceable accessory**

accessory constructed so that it can only be rewired, repaired or replaced by manufacturer's authorised personnel or skilled person according to national regulations

3.14**terminal**

conductive part provided for the connection of a conductor to an accessory

3.14.1**pillar terminal**

terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw or screws

Note 1 to entry: The clamping pressure may be applied directly by the shank of the screw or through an intermediate clamping member to which pressure is applied by the shank of the screw.

Note 2 to entry: See Figure 2 a).

3.14.2**screw terminal**

terminal in which the conductor is clamped under the head of the screw

Note 1 to entry: The clamping pressure may be applied directly by the head of the screw or through an intermediate part, such as a washer, clamping plate or anti-spread device.

Note 2 to entry: See Figure 2 b).

3.14.3**stud terminal**

terminal in which the conductor is clamped under a nut

Note 1 to entry: The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, clamping plate or anti-spread device.

Note 2 to entry: See Figure 2 c).

3.14.4**saddle terminal**

terminal in which the conductor is clamped under a saddle by means of two or more screws or nuts

Note 1 to entry: See Figure 2 d).

3.14.5**lug terminal**

screw terminal or a stud terminal, designed for clamping a cable lug or bar by means of a screw or nut

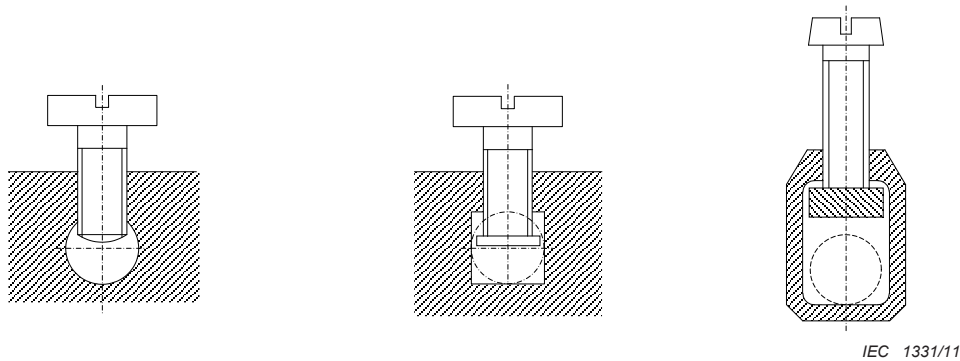
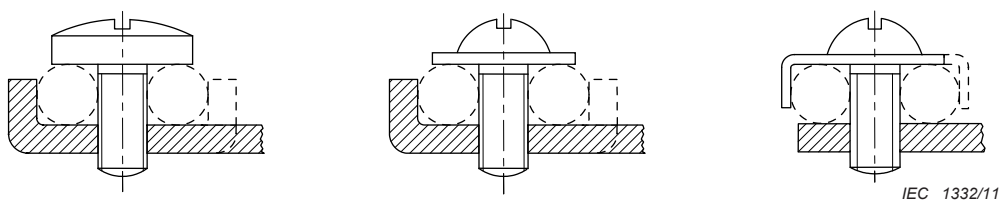
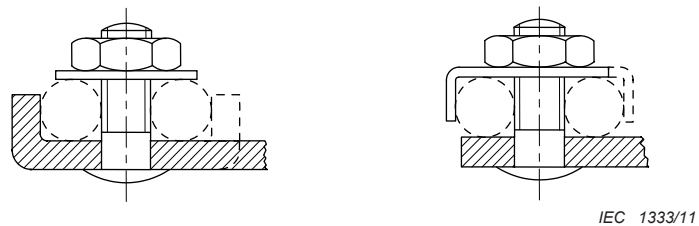
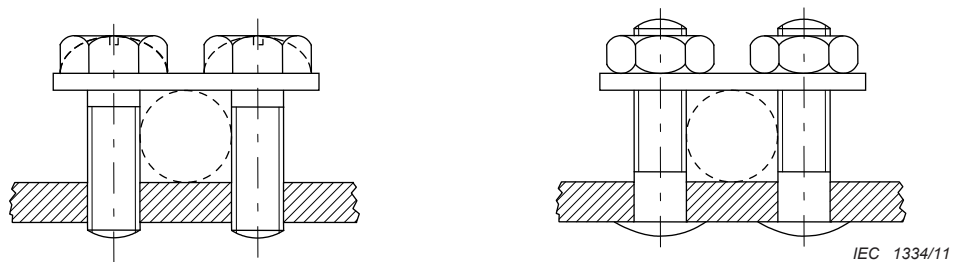
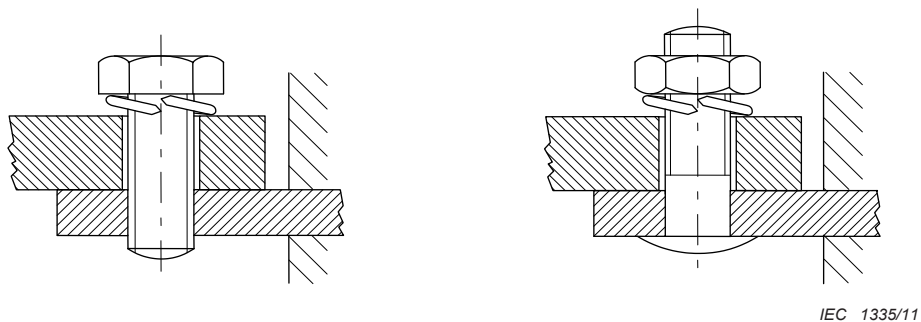
Note 1 to entry: See Figure 2 e).

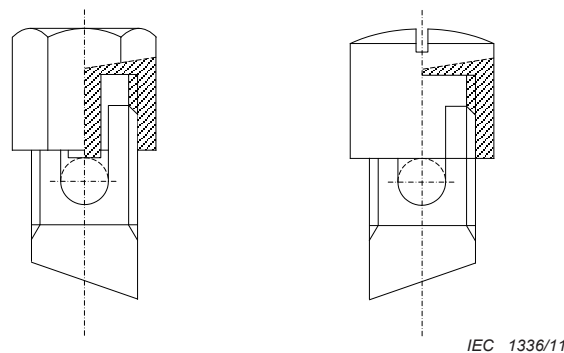
3.14.6**mantle terminal**

terminal in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut

Note 1 to entry: The conductor is clamped against the base of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut, or by equally effective means for transmitting the pressure from the nut to the conductor within the slot.

Note 2 to entry: See Figure 2 f).

**a) Pillar terminals****b) Screw-type terminals****c) Stud terminals****d) Saddle terminals****e) Lug terminals**



f) Mantle terminals

Figure 2 – Examples of terminals**3.15****clamping unit**

part of a terminal necessary for the clamping and the electrical connection of the conductor

3.16**cable management system**

device which is intended to protect a cable assembly from mechanical damage and/or to facilitate its handling

EXAMPLE A cable suspension device is an example of cable management system.

3.17**cap**

part separated or attached, which may be used to provide the degree of protection of a plug or vehicle inlet, when it is not engaged with a socket-outlet or a vehicle connector

3.18**cover**

means providing the degree of protection of an accessory when it is not engaged with a socket-outlet or vehicle connector

Note 1 to entry: It can be used as the retaining means or a part of the retaining means.

Note 2 to entry: Caps, lids, shutters and similar devices can perform the function of a cover.

3.19**lid**

means to ensure the degree of protection on an accessory

Note 1 to entry: A lid is generally hinged.

3.20**universal a.c.**

interface which provides for high power a.c. and 32 A a.c.

3.21**universal d.c.**

interface which provides for high power d.c. and 32 A a.c

3.22**combined**

interface which provides for a.c. and d.c.

3.23**rated current**

current assigned to the accessory by the manufacturer for a specified operating condition of an accessory

3.24**rated operating voltage**

nominal voltage of the supply(ies) for which the pole of the accessory is intended to be used

3.25**insulation voltage**

voltage assigned to the accessory by the manufacturer and to which dielectric tests, clearances and creepage distances are referred

3.26**reinforced insulation**

improved basic insulation with such mechanical and electrical qualities that it provides the same degree of protection against electric shock as double insulation

3.27**double insulation**

insulation comprising both basic insulation and supplementary insulation

3.28**isolation monitor****IM**

electrical circuit to monitor the vehicle to electric vehicle supply equipment earth isolation function

3.29**off-board isolation function**

function of off-board charger which provides the electrical isolation for personnel protection against electric shock

3.30**conditional short-circuit current**

prospective current that an accessory, protected by a specified short-circuit protective device, can withstand satisfactorily for the total operating time of that device under specified conditions of use and behaviour

[SOURCE: IEC 60050-441:1984, 441-17-20, modified – the concept of current-limiting device has been broadened into a short-circuit protective device, the function of which is not only to limit the current.]

3.31**extra-low voltage****ELV**

voltage not exceeding the relevant voltage limit of band I specified in IEC 60449

[SOURCE: IEC 60050-826:2004, 826-12-30]

3.32**safety extra-low voltage system****SELV**

electric system in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions and
- under single fault conditions, including earth faults in other electric circuits

[SOURCE: IEC 60050-826:2004, 826-12-31]

3.33**connection**

single conductive path

3.34**control circuit device**

electrical device intended for the controlling, signalling, interlocking, etc. of switchgear and controlgear (see IEC 60947-1:2007, 2.1.1)

[SOURCE: IEC 60309-4:2006, 2.107]

3.35**domestic**

intended for household and similar purposes, up to a maximum current rating of 30 A to 32 A a.c.

3.36**electric vehicle**

any vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable using energy from a source off the vehicle such as residential or public electric service), which is manufactured primarily for use on public streets, roads or highways

3.37**electric vehicle supply equipment****EVSE**

conductors, including the phase, neutral and protective earth conductors, the electric vehicle couplers, attachment plugs, and all other accessories, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premises wiring to the electric vehicle and allowing communication between them if required

3.38 In-cable assemblies**3.38.1****in-cable control box****ICCB**

device which is incorporated in the cable assembly and which performs control functions

3.38.2**in-cable control and protective device****IC-CPD**

an assembly for supplying electric vehicles in charging mode 2, which performs control functions and safety functions.

Note 1 to entry: The IC-CPD is described in IEC 62752².

3.39**auxiliary power**

electrical energy provision from an external source used for purposes other than charging of the electric vehicle propulsion battery

² Under consideration.

3.40

thermal cut-out

temperature sensitive device which limits the temperature of an accessory, or of parts of it, during operation by automatically opening the circuit or by reducing the current, and which is so constructed that its settings cannot be altered by the user

4 General

4.1 General requirements

The accessories covered by this standard shall only be used with vehicles that comply with the requirements of IEC 61851-1:2010, 7.2.3.1.

Accessories shall be so designed and constructed that in normal use their performance is reliable and minimises the risk of danger to the user or surroundings.

Compliance is checked by meeting all of the relevant requirements and tests specified.

Accessories shall be so designed and constructed that it is not possible to make a cord extension set (see IEC 61851-1). The plug and the vehicle connector shall not be compatible.

Compliance is checked by a manual test.

4.2 General notes on tests

4.2.1 Tests according to this standard are type tests. If a part of an accessory has previously passed tests for a given degree of severity, the relevant type tests shall not be repeated if the severity is not greater.

4.2.2 Unless otherwise specified, the samples are tested as delivered and under normal conditions of use, at an ambient temperature of $(20 \pm 5) ^\circ\text{C}$; the tests are made at rated frequency.

4.2.3 Unless otherwise specified, the tests are carried out in the order of the clauses of this standard.

4.2.4 Three samples are subjected to all the tests, except if necessary for the test of 22.3, three new additional samples are tested. For the test of Clause 31 one new additional sample is tested. . If, however, the tests of Clauses 22, 23 and 24 have to be carried out with both d.c. and a.c., the tests with a.c. in Clauses 22, 23 and 24, are made on three additional samples.

4.2.5 Accessories are deemed to comply with this standard if no sample fails in the complete series of appropriate tests. If one sample fails in a test, that test and those preceding which may have influenced the test result are repeated on another set of three samples, all of which shall then pass the repeated tests.

In general, it will only be necessary to repeat the test which caused the failure, unless the sample fails in one of the tests of Clauses 23 and 24, in which case the tests are repeated from that of Clause 22 onwards. The applicant may submit, together with the first set of samples, an additional set which may be wanted should one sample fail. The testing station, without further request, will then test the additional samples and will only reject if a further failure occurs. If the additional set of samples is not submitted at the same time, the failure of one sample will entail a rejection.

4.2.6 When the tests are carried out with conductors, they shall be copper or copper alloy and comply with IEC 60227 series, IEC 60228:2004, Clause 3, solid (class 1), stranded (class 2), flexible (class 5 and 6), and IEC 60245-4.

5 Ratings

5.1 Preferred rated operating voltage ranges

The preferred rated operating voltage ranges are:

0 V	to	30 V	(signal or control purposes only)
100 V a.c.	to	130 V a.c.	
200 V a.c.	to	250 V a.c.	
380 V a.c.	to	480 V a.c.	
600 V a.c.	to	690 V a.c.	
480 V d.c.			
600 V d.c.			
750 V d.c.			
1 000 V d.c.			

5.2 Preferred rated currents

5.2.1 General

The preferred rated currents are:

13 A	
16 A	to 20 A
30 A	to 32 A
60 A	to 63 A
70 A	
80 A	(d.c. only)
125 A	
200 A	(d.c. only)
250 A	
400 A	(d.c. only)

NOTE 1 In the following countries, the branch circuit overcurrent protection device is based upon 125 % of the accessory rating: US.

NOTE 2 Throughout this standard, reference to a 16 A to 20 A or 30 A to 32 A or 60 A to 63 A rating is made in accordance with National requirements.

5.2.2 Rated current for signal or control purposes

Rated current for signal or control purposes is 2 A.

For configuration AA, control pilot contacts are rated 30 V, 10 A

NOTE 1 For configurations AA, see IEC 62196-3:2014 standard sheets 3-Ia to 3-If.

For configuration BB, auxiliary power supply contacts are rated 30 V, 20 A. The auxiliary power supply may consist of a safety extra low voltage system circuit.

NOTE 2 For configurations BB, see IEC 62196-3:2014 standard sheets 3-IIa and 3-IIb.

5.2.3 Accessories not suitable for making and breaking an electrical circuit under load

An accessory rated 250 A a.c. shall be classified as not suitable for making and breaking an electrical circuit under load.

An accessory rated above 30 V d.c. shall be classified as not suitable for making and breaking an electrical circuit under load.

NOTE In the following country, "not suitable for making and breaking an electric circuit under load" is considered "disconnect use only": CA.

5.2.4 Accessories suitable for, or not suitable for, making and breaking an electrical circuit under load

An accessory, with a pilot circuit contact may be classified as suitable for, or not suitable for, making and breaking an electrical circuit under load. See 7.4.

6 Connection between the power supply and the electric vehicle

6.1 General

This clause provides a description of the physical conductive electrical interface requirements between the vehicle and the power supply, which allows different types at the vehicle interface:

- a) a universal interface for all modes of charging which provides for either:
 - 1) high power a.c. and 32 A a.c., or
 - 2) high power d.c. and 32 A a.c.,
- b) a basic interface for mode 1, 2 and 3 charging only,
- c) d.c. interface
- d) a combined interface.

NOTE Refer to IEC 62196-2 for a.c. ratings and types and to IEC 62196-3 for d.c. or a.c./d.c. ratings and types.

6.2 Types of vehicle inlets

There are five types of vehicle inlets:

- universal, high power a.c.
- universal, high power d.c.
- basic
- d.c.
- combined.

6.3 Types of vehicle connectors

There are five types of vehicle connectors as shown in Table 1:

- universal, high power a.c.
- universal, high power d.c.
- basic
- d.c.
- combined.

Table 1 – Compatibility of mating accessories at vehicle

		Vehicle connector												
Vehicle inlet		Type 1	Type 2	Type 3	Configuration AA	Configuration BB	Configuration CC	Configuration DD	Configuration EE	Configuration FF	Universal, high power a.c./a.c.	Universal, high power a.c./d.c.		
Basic configurations	Type 1	Yes	-	-	-	-			-	-	-	-		
	Type 2	-	Yes	-	-	-			-	-	-	-		
	Type 3	-	-	Yes	-	-			-	-	-	-		
d.c.	Configuration AA	-	-	-	Yes	-			-	-	-	-	-	
	Configuration BB	-	-	-	-	Yes			-	-	-	-	-	
Combined configurations d.c. and a.c.	Configuration CC	Reserved for future use												
	Configuration DD	Reserved for future use												
	Configuration EE	Yes	-	-	-	-			Yes	-	-	-	-	
	Configuration FF	-	Yes	-	-	-			-	Yes	-	-	-	
Universal, high power a.c./a.c.		-	-	-	-	-			-	-	-	-	Yes	-
Universal, high power a.c./d.c.		-	-	-	-	-			-	-	-	-	-	Yes
NOTE 1 For Type 1, Type 2, and Type 3, refer to the corresponding standard sheets in IEC 62196-2:2011.														
NOTE 2 For Configurations AA, BB, EE, and FF, refer to the corresponding standard sheets IEC 62196-3.														
NOTE 3 This table shows the actual status of accessories but does not preclude the development of other accessories.														

6.4 Universal interface

The universal interface may contain up to 13 power or signal contacts, with only one physical configuration of contact positions. These positions may be used or not, according to the mode of charging of the vehicle. The electrical ratings and their function are described in Table 2.

Table 2 – Overview of the universal vehicle interface

Position n°	High power a.c./a.c.	High power d.c./a.c.	Functions ^a
1	500 V 250 A ^b	600 V 400 A ^b	High power d.c. or a.c.
2	500 V 250 A	600 V 400 A ^b	High power d.c. or a.c.
3	500 V 250 A	--	High power a.c.
4	480 V 32 A ^c	480 V 32 A ^c	L1 (Mains 1)
5	480 V 32 A	480 V 32 A	L2 (Mains 2)
6	480 V 32 A	480 V 32 A	L3 (Mains 3)
7	480 V 32 A	480 V 32 A	N (Neutral)
8	Rated for fault ^d	Rated for fault ^d	PE (Protective Ground/Earth)
9	30 V 2 A	30 V 2 A	Control pilot
10	30 V 2 A	30 V 2 A	Communication 1 (+)
11	30 V 2 A	30 V 2 A	Communication 2 (–)
12	30 V 2 A	30 V 2 A	Clean data earth
13	30 V 2 A	30 V 2 A	Proximity
^a For contacts 9 to 13, environmental conditions may demand larger conductor cross-sections. ^b For high power contacts, a duty cycle is under consideration. ^c In the following countries, the branch circuit overcurrent protection is based upon 125 % of the device rating: US. ^d "Rated for fault" means "rated for the highest fault current".			

The universal vehicle inlet shall be compatible with either the high power a.c. vehicle connector or the high power d.c. vehicle connector. This vehicle inlet shall be compatible with the 32 A a.c. vehicle connector, as shown in Table 1. A means shall be provided to prevent the connection of d.c. power from the vehicle connector with the a.c. vehicle inlet and vice versa.

The "universal, high power a.c." refers to an interface where separate contacts are provided for both low power a.c. and high power a.c. connections.

The "universal, high power d.c." refers to an interface where separate contacts are provided for both low power a.c. and high power d.c. connections.

6.5 Basic interface

The basic interface may contain up to 7 (power or signal) contacts, with physical configurations of contact positions for single-phase and for three-phase or both. The electrical ratings and their functions are described in Table 3.

The basic vehicle inlet shall be compatible with either the single-phase or the three-phase vehicle connector. It shall not be possible to connect the basic vehicle connector with a universal a.c. or d.c. vehicle inlet.

This vehicle coupler is rated 250 V, 32 A single-phase or 480 V, 32 A, three-phase. It may include additional contacts for control pilot wire and power indicator (proximity function).

Table 3 – Overview of the basic vehicle interface

Position number ^a	a.c.		Functions
	Single phase	Three phase	
1	250 V 32 A ^b	480 V 32 A ^b	L1 (Mains 1)
2	—	480 V 32 A	L2 (Mains 2)
3	—	480 V 32 A	L3 (Mains 3)
4	250 V 32 A	480 V 32 A	N (Neutral)
5	Rated for fault ^c		PE (Protective Ground/Earth)
6	30 V 2 A		Control pilot
7	30 V 2 A		Proximity

^a Position number does not refer to the location and/or identification of the contact in the accessory

^b In the following countries, the branch circuit overcurrent protection is based upon 125 % of the device rating: US.

^c “Rated for fault” means “rated for the highest fault current”.

6.6 D.C. configurations

For d.c. configurations, the d.c. interface may contain up to 12 (power or signal) contacts, with only one physical configuration of contact positions.

For use with non-isolated d.c. charging equipment, the interface shall be provided with a contact for protective earthing conductors.

For use with isolated d.c. charging equipment, the interface may be provided with a contact for protective earthing conductors.

The interfaces shall be used with one of the specific electric vehicle charging systems described in one of the Annexes AA, BB or CC in IEC 61851-23:—.

It shall not be possible to connect the d.c. vehicle connector with a universal d.c. vehicle inlet or combined inlet.

The electrical ratings and their function are described in Table 4. See IEC 62196-3 for additional details.

Table 4 – Overview of the d.c. vehicle interface

Position number a	Configuration					
	AA		BB			
	$U_{\max}$ V	$I_{\max}$ A	$U_{\max}$ V	$I_{\max}$ A	Symbol	Function
1	600	200	750	250	D.C. +	D.C. +
2	600	200	750	250	D.C. –	D.C. –
3	30	10	30	2	CP	Control Pilot 1
4	30	10	30	2	CP2	Control Pilot 2
5	30	10	-	-	CP3	Control Pilot 3
6	30	2	30	2	COM1	Communication 1 (+)
7	30	2	30	2	COM2	Communication 1 (–)
8	30	2	-	-	IM	Isolation Monitor
9	-	-	750	Rated for fault b	E	Protective earth
10	30	2	-	-	PP or CS	Proximity detection or connection switch
11	-	-	30	20	AUX1	Auxiliary Power Supply 1 (+)
12	-	-	30	20	AUX2	Auxiliary Power Supply 1 (–)
a Position number does not refer to the location and/or identification of the contact in the accessory.						
b “Rated for fault” means “rated for the highest fault current”.						
NOTE For d.c. vehicle interface, see IEC 62196-3.						

6.7 Combined interface

The combined interface extends the use of a basic interface for a.c. and d.c. charging.

The combined interface has two distinct contact arrangements:

- Group 1 uses the same power contacts (under consideration) to supply either a.c. or d.c. energy to the electric vehicle.
- Group 2 is provided with separate a.c. and d.c. power contacts to supply either a.c. or d.c. energy to the electric vehicle.

The basic portion of the combined vehicle inlet can be used with a basic vehicle connector or a combined vehicle connector.

Combined vehicle couplers shall only be used for d.c. charging with the d.c. electric vehicle charging station of System C described in IEC 61851-23:—, Annex CC.

The electrical ratings and their function are described in Table 5. See IEC 62196-3 for additional details.