

BS EN 62196-1:2012+A12:2014



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 62196-1:2012+A12:2014. It is derived from IEC 62196-1:2011. It supersedes BS EN 62196-1:2012+A11:2013, which will be withdrawn on 16 June 2017.

Where a common modification has been introduced by amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A11 are indicated by  .

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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014.
Published by BSI Standards Limited 2014

ISBN 978 0 580 85337 1

ICS 29.120.30; 43.120

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2012.

Amendments/corrigenda issued since publication

Date	Text affected
31 July 2013	Implementation of CENELEC amendment A11:2013
30 September 2014	Implementation of CENELEC amendment A12:2014

**Plugs, socket-outlets, vehicle connectors and vehicle inlets -
Conductive charging of electric vehicles -
Part 1: General requirements
(IEC 62196-1:2011)**

Fiches, socles de prise de courant, prises
mobiles et socles de connecteur de
véhicule -
Charge conductive des véhicules
électriques -
Partie 1: Règles générales
(CEI 62196-1:2011)

Stecker, Steckdosen,
Fahrzeugkupplungen und
Fahrzeugstecker -
Konduktives Laden von Elektrofahrzeugen
-
Teil 1: Allgemeine Anforderungen
(IEC 62196-1:2011)

This European Standard was approved by CENELEC on 2012-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 23H/266/FDIS, future edition 2 of IEC 62196-1, prepared by SC 23H, "Industrial plugs and socket-outlets", of IEC TC 23, "Electrical accessories" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62196-1:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-11-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-02-01

This document supersedes EN 62196-1:2003.

EN 62196-1:2012 includes the following significant technical changes with respect to EN 62196-1:2003:

- increase in d.c.voltage for accessories;
- permitted use of accessories with vehicles complying with 7.2.3.1 of EN 61851-1:2011;
- minor changes to definitions;
- additional voltage and current ratings (Clause 5) and test values (Clauses 12 and 13) ;
- removal of markings to identify generic types of vehicle inlets and connectors;
- addition of a "high power d.c." to the type of accessories covered by the Standard;
- modification of the description of "universal" and "basic" interfaces based on changes to EN 61851-1:2011;
- simplification of the marking requirements (Clause 8);
- additional requirements for accessories with shutters;
- division of Clause 9 to create Clauses 9 and 11;
- Clause 9: specific requirements for inlet, plug and socket-outlet;
- Clause 11: EVSE (Electric Vehicle Supply Equipment) requirements: the basic generic requirements for charging stations;
- renumbering of annexes.

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

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.

Endorsement notice

The text of the International Standard IEC 62196-1:2011 was approved by CENELEC as a European Standard without any modification.

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

IEC 60068-2-75:1997	NOTE Harmonized as EN 60068-2-75:1997 (not modified).
IEC 60309-1	NOTE Harmonized as EN 60309-1.
IEC 61008-1	NOTE Harmonized as EN 61008-1.
IEC 61009-1	NOTE Harmonized as EN 61009-1.

Foreword to amendment A11

This document (EN 62196-1:2012/A11:2013) has been 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".

The following dates are fixed:

- latest date by which this document has to be implemented (dop) 2013-10-15
at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with (dow) 2017-10-15
this document have to be withdrawn

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 document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

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

Foreword to amendment A12

This document (EN 62196-1:2012/A12:2014) has been 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".

The following dates are fixed:

- latest date by which this document has to be (dop) 2015-06-16
implemented at national level by publication of
an identical national standard or by
endorsement
- latest date by which the national standards (dow) 2017-06-16
conflicting with this document have to
be withdrawn

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

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.

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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60112	2003	Method for the determination of the proof and	EN 60112	2003
+ corr. October	2003	the comparative tracking indices of solid	+ A1	2009
+ corr. June	2003	insulating materials		
+ A1	2009			
IEC 60227	Series	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V	-	-
IEC 60228	2004	Conductors of insulated cables	EN 60228	2005
			+ corr. May	2005
IEC 60245-4 (mod)	1994	Cables of rated voltages up to and including	HD 22.4 S3 ¹⁾	1995
+ A1	1997	450/750 V and having cross-linked insulation -	+ A1	1999
+ A2	2003	Part 4: Cords and flexible cables	+ A2	2002
IEC 60269-1	2006	Low-voltage fuses -	EN 60269-1	2007
+ A1	2009	Part 1: General requirements	+ A1	2009
IEC 60269-2 (mod)	2010	Low-voltage fuses -	HD 60269-2	2010
		Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Examples of standardized systems of fuses A to J		
IEC 60309-4	-	Plugs, socket-outlets and couplers for industrial purposes -	EN 60309-4	-
		Part 4: Switched socket-outlets and connectors with or without interlock		
IEC 60529	1989	Degrees of protection provided by enclosures	EN 60529	1991
+ A1	1999	(IP Code)	+ corr. May	1993
			+ A1	2000
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems -	EN 60664-1	2007
		Part 1: Principles, requirements and tests		
IEC 60664-3	2003	Insulation coordination for equipment within low-voltage systems -	EN 60664-3	2003
		Part 3: Use of coating, potting or moulding for protection against pollution		
IEC 60695-2-11	2000	Fire hazard testing -	EN 60695-2-11	2001
+ corr. January	2001	Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products		
IEC 60695-10-2	-	Fire hazard testing -	EN 60695-10-2	-
		Part 10-2: Abnormal heat - Ball pressure test		

¹⁾ HD 22.4 S3 is superseded by HD 22.4 S4:2004.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60947-1	-	Low-voltage switchgear and controlgear - Part 1: General rules	EN 60947-1	-
IEC 60999-1	1999	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm ² up to 35 mm ² (included)	EN 60999-1	2000
IEC 60999-2	2003	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 2: Particular requirements for clamping units for conductors above 35 mm ² up to 300 mm ² (included)	EN 60999-2	2003
IEC 61851-1	2010	Electric vehicle conductive charging system - Part 1: General requirements	EN 61851-1	2011
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	-	-

Annex ZB
(normative)

Special national conditions

Special national condition: National characteristic or practice that cannot be changed even over a long period, e.g. climatic conditions, electrical earthing conditions.

NOTE If it affects harmonization, it forms part of the European Standard / Harmonization Document.

For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

Clause	Special national condition
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1	Italy
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	In Italy, in case of charging in mod1 and mod2 by socket outlets according to CEI 23-50, the charging current is limited to 10 A.
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1	United Kingdom
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	Mode 1 will not be used in the United Kingdom.
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9.1	Italy
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	In Italy, plugs and sockets outlet shall also comply with EN 62196-2.
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10.1	France
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	Accessories shall be so designed that live parts of socket-outlets and vehicle connectors, when they are wired as in normal use, and live parts of plugs and vehicle inlets, when they are in partial or complete engagement with the complementary accessories, are not accessible.
--	--

	<i>Add the two following paragraphs after the above paragraph:</i>
--	--

	Shutters are compulsory on live (phase and neutral) contact holes of socket-outlets when these socket-outlets are accessible to uninstructed persons (ordinary persons BA1, handicapped persons BA2 or children BA3).
--	---

	Shutters are compulsory on live (phase and neutral) contact holes of connectors when these connectors are permanently wired to the fixed installation and are accessible to uninstructed persons (ordinary persons BA1, handicapped persons BA2 or children BA3).
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10.1	Germany
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	IPxxB concerning protection against electric shock is sufficient for plugs, sockets, vehicle connectors, vehicle inlets and cable assemblies as described by this standard.
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10.1	Italy
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	In Italy, in case of EV charging mode 3 shutters or equivalent safety system are compulsory on live (phase and neutral) contact holes of socket-outlets or connectors.
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10.1	Portugal
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	Shutters are compulsory on live (phase and neutral) contact holes of socket-outlets and connectors not exceeding 16 A when these accessories are accessible to uninstructed persons (ordinary persons BA1, handicapped persons BA2 or children BA3).
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	In locations with restricted access to skilled persons, socket-outlets and connectors without shutters may be accepted.
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10.1	Switzerland
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	IPxxB concerning protection against electric shock is sufficient for plugs, sockets, vehicle connectors, vehicle inlets and cable assemblies as described by this standard. C11
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C12 10.1	Spain
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	For installations in dwellings and for 16 A applications, Wiring Rules describe the use of socket-outlets with shutters. C12
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INTRODUCTION

IEC 61851-1:2010 specifies Electric Vehicle Conductive Charging Equipment. This International Standard, referred to as IEC 62196 series in IEC 61851-1:2010, specifies the requirements for plugs, socket-outlets, vehicle connectors, vehicle inlets and cable assemblies as described in IEC 61851-1:2010. 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. This standard 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.

This standard may be divided into several parts as necessary, as follows:

- Part 1: General requirements, comprising clauses of a general character.

Subsequent parts: Particular requirements dealing with particular types of accessories. The clauses of these particular requirements supplement or modify the corresponding clauses in Part 1. Where the text of subsequent parts indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of Part 1, these changes are made to the relevant text of Part 1, which then becomes part of the standard. Where no change is necessary, the words "This clause of Part 1 is applicable" are used.

- Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories.
- Part 3: Dimensional compatibility and interchangeability requirements for pin and contact-tube accessories for dedicated d.c. charging or for combined a.c./d.c. charging (under consideration)

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, connectors, inlets and cable assemblies for electric vehicles (EV), 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 – 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 and cable assemblies are intended to be used for circuits specified in IEC 61851-1:2010 which operate at different voltages and frequencies and which may include ELV and communication signals.

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

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

NOTE In some countries, other requirements may apply.

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

The accessories covered by this standard are for use in certain modes of charging EVs. These modes are defined in IEC 61851-1:2010. These definitions and a description of the types of connection (cases A, B and C), also described in IEC 61851-1:2010, are reproduced herein as Annex A.

 Text deleted 

This standard 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 61851-1:2010.

This standard can 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 referenced documents are indispensable for the application 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 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*
Amendment 1 (2009)¹

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 60245-4:1994, *Rubber insulated cables of rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*
Amendment 1 (1997)
Amendment 2 (2003)²

IEC 60269-1:2006, *Low-voltage fuses – Part 1: General requirements*
Amendment 1 (2009)³

IEC 60269-2:2010, *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 J*

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

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*
Amendment 1 (1999)⁴

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

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-11:2004, *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 60947-1, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60999 -1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for conductors from 0,2 mm² up to 35 mm² (included)*

IEC 60999 -2:2003, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm² up to 300 mm² (included)*

¹ There exists a consolidated edition (2009) that includes IEC 60112 (1993) and its Amendment 1 (2009).

² There exists a consolidated edition (2004) that includes IEC 60245-4 (1994) and its Amendments 1 (1997) and 2 (2003).

³ There exists a consolidated edition (2009) that includes IEC 60269-1 (2006) and its Amendment 1 (2009).

⁴ There exists a consolidated edition (2001) that includes IEC 60529 (1989) and its Amendment 1 (1999).

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

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 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 Throughout this standard, the word «earthing» is used for «protective earthing» unless otherwise specified.

NOTE 3 The terms «basic interface» and «universal interface» refer to terms described in IEC 61851-1.

NOTE 4 The application of accessories is shown in Figure 1.

3.1

cable assembly

piece of equipment which is used to establish the connection between the electric vehicle and the electric vehicle supply equipment (EVSE). It 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 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

cable management system

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

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

3.3

cap

a 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 connector

3.4

clamping unit

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

3.5

compatibility, compatible

ability of accessories to join together and be safely functional 

NOTE Non-compatible accessories may physically join together, but not be functional.

3.6

conditional short-circuit current

the 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

NOTE This definition differs from IEC 60050-441 definition 17-20 by broadening the concept of current-limiting device into a short-circuit protective device, the function of which is not only to limit the current.

3.7

connection

a single conductive path

3.8

cover

a means providing the degree of protection of an accessory when it is not engaged with a socket-outlet or vehicle connector. It can be used as the retaining means or a part of the retaining means

NOTE Caps, lids, shutters and similar devices can perform the function of a cover.

3.9

domestic

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

3.10

double insulation

insulation comprising both basic insulation and supplementary insulation

3.11

electric vehicle

EV

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

3.12

EV supply equipment

EVSE

conductors, including the phase, neutral and protective earth conductors, the EV 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 EV and allowing communication between them if required

3.13

in-cable control box

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

NOTE The location of the in-cable control box is defined in IEC 61851-1:2010.

3.14

insulation voltage

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

3.15

interchangeability, interchangeable

ability of an accessory to replace another, without any modification

NOTE Interchangeable accessories generally have similar outer dimensions, fixing centers, etc.

3.16

interlock

a device, either electrical or mechanical, which prevents the 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 contacts are live or makes the contacts dead before separation

3.17

lid

a means to ensure the degree of protection on a socket-outlet or a vehicle connector

NOTE A lid is generally hinged.

3.18

locking mechanism

a means to allow engagement of a device intended to reduce the likelihood of tampering with, or an unauthorised removal of, the accessories

3.19

non-rewireable accessory

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

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

3.20

plug and socket-outlet

a means enabling the connection at will of a flexible cable to fixed wiring. It consists of two parts: a socket-outlet and a plug

3.20.1

plug

the 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. It may include mechanical, electrical or electronic components and circuitry, which perform control functions

3.20.2

socket-outlet

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

3.21

rated current(s)

the current assigned to the accessory by the manufacturer

3.22

rated operating voltage

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

3.23

reinforced insulation

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

3.24

retaining means, retaining device (latch)

a mechanical arrangement which holds a plug or vehicle connector in position when it is in proper engagement, and prevents its unintentional withdrawal

3.25

rewireable accessory

an accessory so constructed that the cable or wiring can be replaced. It can be either a user-serviceable accessory or a field-serviceable accessory

3.25.1

user-serviceable accessory

an 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

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

3.25.2

field-serviceable accessory

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

3.26

terminal

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

3.26.1

pillar terminal

a terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw or screws. 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 See Figure 9a.

3.26.2

screw terminal

a terminal in which the conductor is clamped under the head of the screw. 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 See Figures 9b and 9c.

3.26.3

stud terminal

a terminal in which the conductor is clamped under a nut. 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 See Figure 9d.

3.26.4

saddle terminal

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

NOTE See Figure 9e.

3.26.5

lug terminal

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

NOTE See Figure 9f.

3.26.6

mantle terminal

a terminal in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut. 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 See Figure 9g.

3.27

vehicle coupler

EV coupler

a means enabling the connection at will of a flexible cable to an electric vehicle. It consists of two parts: a vehicle connector and a vehicle inlet

3.27.1

connector

vehicle connector

EV connector

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

3.27.2

vehicle inlet

EV inlet

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

3.21

shutter

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

[SOURCE: IEC 442-03-05, modified] 

4 General

4.1 General requirements

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 61851-1:2010). 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 Clause 31, one new additional sample is tested. If, however, the tests of Clauses 22, 23 and 24 have to be made 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.

NOTE 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, the additional set which may be wanted should one sample fail. The testing station, without further request, will then test the additional samples and will reject only 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 and comply with IEC 60227, IEC 60228 [Clause 3, solid (class 1), stranded (class 2), flexible (class 5 and 6)], and IEC 60245-4 as accessories according to this standard are intended to be connected to cables with copper or copper-alloy conductors only.

5 Ratings

5.1 Preferred rated operating voltage ranges:

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

5.2 Preferred rated currents:

13 A
16 – 20 A
30 – 32 A
60 – 63 A
70 A
125 A
200 A (d.c. only)

250 A

400 A (d.c. only)

 Text deleted 

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

5.3 Rated current for signal or control purposes is 2 A.

5.4 An accessory rated 250 A a.c. or above 30 V d.c. shall be rated for disconnecting use only, not for current interruption.

5.5 An accessory, rated up to and including 70 A, with a pilot circuit contact may be rated as suitable for, or not suitable for, making and breaking an electrical circuit. See 7.4.

6 Connection between the power supply and the electric vehicle

6.1 This section 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) a high power d.c.

6.2 There are four types of vehicle inlets:

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

6.3 There are four types of vehicle connectors:

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

6.4 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.

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.

Table 1 – Compatibility of mating devices at vehicle

	Vehicle connector			
Vehicle Inlet	Universal a.c.	Universal d.c.	Basic	High power d.c.
Universal a.c.	Yes	No	No	No
Universal d.c.	No	Yes	No	Yes
Basic	No	No	Yes	No
High power d.c.	No	No	No	Yes

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	E (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 12, 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 current".			

6.5 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 function 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 and power indicator.

Table 3 – Overview of the basic vehicle interface

Position number ^c	a.c.		Functions ^a
	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		E (Ground/Earth)
6	30 V 2 A		Control pilot
7	30 V 2 A		Proximity
^a For contacts 6 and 7, environmental conditions may demand larger conductor cross-sections.			
^b In the following countries, the branch circuit overcurrent protection is based upon 125% of the device rating: US.			
^c Position number does not refer to the location and/or identification of the contact in the accessory			

6.6 D.C. interface

Under consideration

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

Under consideration

6.7 Contact sequencing

The contact sequence during the connection process shall be

- Earth contact,
- Neutral contact N,
- Line contact L1, [and L2 and L3, if any],
- Control pilot contact.

The proximity contact or connection switch contact, if any, shall make before or simultaneously with the control pilot contact.

NOTE The proximity contact or connection switch contact may close, for example, immediately after the earth contact.

During disconnection, the order shall be reversed.

The neutral contact N shall make before or simultaneously with Line contacts L₁, L₂ and L₃ and break after or simultaneously with Line contacts L₁, L₂ and L₃. See 10.3.

7 Classification of accessories

7.1 According to purpose

Plugs, socket-outlets, vehicle connectors, vehicle inlets, and cable assemblies.

7.2 According to the method of connecting the conductors

- Rewireable accessories;
- Non-rewireable accessories.

7.3 According to serviceability

- Field serviceable;
- User serviceable.

7.4 According to electrical operation

- Suitable for making and breaking an electrical circuit under load;
- Not suitable for making and breaking an electrical circuit under load.

7.5 According to function as specified in Clause 6 and 61851-1:2010

- Basic;
- Universal high power a.c.;
- Universal high power d.c.;
- D.C.

7.6 According to use with cable management systems

(Under future consideration)

7.7 According to the locking function (optional)

8 Marking

8.1 Accessories shall be marked with:

- rated current(s) in amperes for power;
- rated maximum operating voltage(s) in volts;
- either the name or trade mark of the manufacturer or of the responsible vendor;
- type reference, which may be a catalogue number.

Compliance is checked by inspection.

8.2 When symbols are used, they shall be as follows:

A amperes
V volts
Hz hertz
 earth
~ alternating current
== direct current

Compliance is checked by inspection.

8.3 For plugs and vehicle connectors, the marking for either the name or trade mark of the manufacturer or the responsible vendor and the type reference, catalogue number or designation shall also be on the outside of the accessory, visible to the user.

8.4 For all accessories, the marking for the maximum rated operating voltage range and rated current shall be on a place which is visible before installation of the accessory. For socket-outlets and vehicle inlets, the marking for either the name or trade mark of the

manufacturer or the responsible vendor and the type reference, catalogue number or designation shall be on a place which is visible before installation of the accessory. It need not be visible after installation.

Compliance is checked by inspection.

8.5 For rewirable accessories, the contacts shall be indicated by the following symbols:

- for three-phase, the symbols L1, L2, L3, N for neutral, if any, and the symbol  for earth;
- for two-pole, the symbols L1, L2 or N for neutral, if any, and the symbol  for earth;
- CP for control pilot;
- PP for proximity contact;
- CS for connection switch;
- L1, L2, L3 (or X, Y, Z), for high power a.c.;
- DC+, DC– for d.c., if any;
- COM1, COM2 for communication contact, if any;
- CDE for clean data earth, if any.

These position numbers shall be placed close to the relevant terminals; they shall not be placed on screws, removable washers or other removable parts.

Compliance is checked by inspection.

8.6 For rewirable accessories, wiring instructions shall be provided.

Compliance is checked by inspection.

8.7 For non-rewirable accessories, the markings in 8.5 and 8.6 are not required.

8.8 Marking shall be indelible and easily legible.

Compliance is checked by inspection and by the following test:

After the humidity treatment of 20.3, the marking is rubbed vigorously by hand for 15 s with a piece of cloth soaked in water and again for 15 s with a piece of cloth soaked with petroleum spirit.

NOTE It is recommended that the petroleum spirit used consist of a solvent hexane with an aromatic content of maximum 0,1 volume percentage, a kauributanol value of approximately 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C, and a density of approximately 0,68 g/cm³.

8.9 Cable assemblies comprised of the cable and one accessory shall be provided with information to identify the wire terminations, terminals, etc., to provide wiring and installation instructions.

The unwired end of a cable assembly intended for connection to a rewirable accessory shall be marked to identify the conductors.

Compliance is checked by inspection.

9 Dimensions

9.1 EV accessories shall comply with the appropriate standard sheets, if any. If no standard sheet is available, the accessories shall comply with the specifications provided by the manufacturer.

9.2 EV accessories shall be compatible only with other standardized EV accessories of the same type.

9.2.1 If other non-EV standardized accessories may be physically joined together with the EV accessories, these shall not be able to function.

NOTE For example, no function can be achieved by switching off the main contacts when no appropriate EV plug and vehicle inlet is inserted (See EN 61851-1). 

9.3 It shall not be possible to make single-pole connections between plugs and socket-outlets or vehicle connectors, and between vehicle inlets and vehicle connectors.

Compliance is checked by inspection and manual test.

9.4 It shall not be possible to engage EV plugs or vehicle connectors with EV socket-outlets or vehicle inlets having different ratings, or having different contact combinations unless safe operation is ensured or other means are provided to ensure safe operation.

In addition, the design shall be such that improper connections between different EV accessories shall not be possible between

- signal and control contacts and a live (power) contact,
- the earth and/or pilot plug-contact and a live socket-contact, or a live plug-contact and the earth and/or pilot socket-contact,
- the phase plug-contacts and the neutral socket-contact, if any,
- a neutral plug-contact and a phase socket-contact.

Insertion of the appropriate accessory is tested for 1 min with a force of 150 N for accessories with a rated current not exceeding 16 A, or 250 N for other accessories.

Where the use of elastomeric or thermoplastic material is likely to influence the result of the test, it is carried out at an ambient temperature of $(50 \pm 2) ^\circ\text{C}$, both the accessories shall be conditioning at this temperature.

Compliance is checked by inspection and manual test.1 

10 Protection against electric shock

10.1 Accessories shall be so designed that live parts of socket-outlets and vehicle connectors, when they are wired as in normal use, and live parts of plugs and vehicle inlets, when they are in partial or complete engagement with the complementary accessories, are not accessible.

 *Text deleted *

In addition, it shall not be possible to make contact between a live part of a plug or vehicle inlet and a live part of a socket-outlet or vehicle connector while any live part is accessible.

 NOTE  Neutral contacts and pilot contacts of socket-outlets and vehicle connectors are deemed to be live parts. Signal, data earth, earth contacts are not considered live parts.

This clause does not apply to contacts and conductors used for signal, data, communications and control circuits.

Compliance is checked by inspection and, if necessary, by a test on the sample wired as in normal use.