IEC 62196-2

Edition 3.0 2022-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles –
Part 2: Dimensional compatibility requirements for AC pin and contact-tube accessories

Fiches, socles de prise de courant, prises mobiles de véhicule et socles de connecteurs de véhicule – Charge conductive des véhicules électriques – Partie 2: Exigences dimensionnelles de compatibilité pour les appareils à broches et alvéoles pour courant alternatif

IEC 62196-2:2022-10(en-fr)

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

Part 2: Dimensional compatibility requirements for AC pin and contact-tube accessories

FOREWORD

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IEC 62196-2 has been prepared by IEC subcommittee 23H: Plugs, socket-outlets and couplers for industrial and similar applications, and for electric vehicles, of IEC technical committee 23: Electrical accessories. It is an International Standard.

This third edition cancels and replaces the second edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) interchangeability requirements have been removed from the title of Part 2;
b) alignment with IEC 62196-1:2022 and IEC 62196-3:2022;
c) alignment with IEC 61851-1:2017.

The text of this International Standard is based on the following documents:

Draft	Report on voting
23H/502/FDIS	23H/506/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all the parts in the IEC 62196 series, published under the general title *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles*, can be found on the IEC website.

This document is to be read in conjunction with IEC 62196-1:2022. The clauses of the particular requirements in this document supplement or modify the corresponding clauses in IEC 62196-1:2022. Where the text indicates "addition" to or "replacement" of the relevant requirement, test specification or explanation of IEC 62196-1:2022, these changes are made to the relevant text of IEC 62196-1:2022, which then becomes part of this document. Where no change is necessary, the words "Clause X of IEC 62196-1:2022 is applicable" are used.

Subclauses, figures, tables, or notes which are additional to those in IEC 62196-1:2022 are numbered starting from 201.

In this document, the following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type;*

– notes: in smaller roman type.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

INTRODUCTION

IEC 61851 (all parts) specifies requirements for electric vehicle (EV) conductive supply equipment.

IEC 62196 (all parts) specifies the requirements for plugs, socket-outlets, vehicle connectors, vehicle inlets and cable assemblies as described in IEC 61851 (all parts).

Some charging using on-board vehicle chargers can be achieved by direct connection from an electric vehicle to an AC supply network using common socket-outlets or by the use of equipment incorporating control and communication circuits.

To support the connection of AC power for such vehicles, this document provides the standard interface configurations of AC vehicle couplers and accessories to be used in conductive charging of electric vehicles, taking the most frequent charging situations into consideration.

IEC 62196 consists of the following parts:

– Part 1: General requirements, comprising clauses of a general character.
– Part 2: Dimensional compatibility requirements for AC pin and contact-tube accessories.
– Part 3: Dimensional compatibility requirements for DC and AC/DC pin and contact-tube vehicle couplers.
– Part 3-1: Vehicle connector, vehicle inlet and cable assembly intended to be used with a thermal management system for DC charging.
– Part 4: Dimensional compatibility requirements for DC pin and contact-tube accessories for Class II or Class III applications.
– Part 6: Dimensional compatibility requirements for DC pin and contact-tube couplers for applications using a system of protective electrical separation.

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

Part 2: Dimensional compatibility requirements for AC pin and contact-tube accessories

1 Scope

This part of IEC 62196 applies to EV plugs, EV socket-outlets, vehicle connectors and vehicle inlets with pins and contact-tubes of standardized configurations, herein referred to as accessories. These accessories have a nominal rated operating voltage not exceeding 480 V AC, 50 Hz to 60 Hz, and a rated current not exceeding 63 A three phase or 70 A single phase, for use in conductive charging of electric vehicles.

This document covers the basic interface accessories for vehicle supply as specified in IEC 62196-1:2022.

NOTE 1 The term "Electric road vehicles (EV)" comprises all road vehicles, including plug-in hybrid road vehicles (PHEV) that derive all or part of their energy from the rechargeable energy storage systems (RESS).

These accessories are intended to be used for circuits specified in IEC 61851-1:2017, which operate at different voltages and frequencies, and which can include extra-low voltage (ELV) and communication signals.

The use of these accessories for bidirectional power transfer is under consideration.

This document applies to accessories to be used in an ambient temperature between –30 °C and +40 °C.

NOTE 2 In the following country, other requirements regarding the lower temperature may apply: NO.

NOTE 3 In the following country, −35 °C applies: SE.

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

Vehicle inlets and vehicle connectors described in this document are intended to be used for charging in modes 1, 2 and 3, cases B and C. The EV socket-outlets and EV plugs covered by this document are intended to be used for charging mode 3 only, case A and B.

The modes and permissible connections are specified in IEC 61851-1:2017.

2 Normative references

Clause 2 of IEC 62196-1:2022 applies, except as follows:

Addition:

IEC 62196-1:2022, *Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements*

3 Terms and definitions

Clause 3 of IEC 62196-1:2022 applies.

4 General

Clause 4 of IEC 62196-1:2022 applies.

5 Ratings

Clause 5 of IEC 62196-1:2022 applies, except as follows:

5.1 Preferred rated operating voltage ranges

Replacement:

Replace the existing text and title of IEC 62196-1:2022, 5.1 with the following:

5.1 Rated operating voltage ranges

Rated operating voltages are as follows:

– 30 V (signal or control purposes only)
– 250 V AC
– 480 V AC

5.2 Preferred rated currents

Replacement:

Replace the existing title of IEC 62196-1:2022, 5.2 and the existing text of Subclause 5.2.1 with the following:

5.2 Rated currents

5.2.1 General

The rated currents are as follows:

– 13 A single phase
– 16 A single and three phase
– 20 A single and three phase
– 30 A or 32 A single and three phase
– 60 A or 63 A single and three phase
– 70 A single phase only

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

NOTE 2 Reference to "30 A or 32 A" and "60 A or 63 A" rating is made in accordance with national requirements.

6 Connection between the power supply and the electric vehicle

Clause 6 of IEC 62196-1:2022 applies, except as follows:

6.1 Interfaces

Replacement:

Replace the existing text of IEC 62196-1:2022, 6.1 with the following:

This Clause 6 provides a description of the physical conductive electrical interface requirements between the vehicle and the power supply, which allows the following design at the vehicle interface:

– a basic interface that provides for current ratings up to 63 A AC three-phase and up to 70 A AC single phase.

Different configuration types for the basic interface may allow different application of mode and current ratings. See introduction to relevant standard sheets for more details.

6.2 Basic interface

Replacement:

Replace the existing text of IEC 62196-1:2022, 6.2 with the following:

There is one type of vehicle inlet:

– basic

The basic interface may contain up to seven power or signal contacts, with unique physical configurations of contact positions for single or three phases. The electrical ratings and their function are described in Table 201 and Table 202. The electrical ratings and their function are described in the standard sheets.

Each vehicle inlet shall only mate with the corresponding type of vehicle connector. Each EV plug shall only mate with the corresponding type of EV socket-outlet.

The accessories, configuration types 1, 2 or 3 are rated as follows:

– configuration type 1 vehicle coupler is rated 250 V, 32 A single phase;
– configuration type 2 vehicle coupler, EV socket-outlet and EV plug are rated:
  - 250 V, 13 A or 20 A or 32 A or 63 A or 70 A single phase,
  - 480 V, 13 A or 20 A or 32 A or 63 A, three phase.
– configuration type 3 vehicle coupler, EV socket-outlet and EV plug are rated:
  - 250 V, 16 A or 32 A, single phase,
  - 480 V, 32 A or 63 A three phase.

Table 201 – Overview of the basic vehicle interface, configuration type 1, single phase

Position number [a]	AC	Functions [c]
1	250 V 32 A[b]	L1 (mains 1)
2	250 V 32 A	L2 (mains 2) / N (neutral)
3	Rated for fault	PE (ground/earth)
4	30 V 2 A	CP (Control pilot)
5	30 V 2 A	CS (Connection switch)

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

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

[c] For contacts 4 and 5, environmental conditions may demand larger conductor cross-sections.

Table 202 – Overview of the basic vehicle interface, configuration types 2 and 3, three phase or single phase

Position number [f]	U_{max}	Three phase		Single phase		Functions
		I_{max} [a]		I_{max} [a]		
	V AC	A		A		
		Type 2	Type 3	Type 2[b]	Type 3	
1	480	63		70	63	L1 (mains 1)[b]
2	480	63		-[c]	-[c]	L2 (mains 2)
3	480	63		-[c]	-[c]	L3 (mains 3)
4	480	63		70	63	N (neutral)[b, e]
5	—	Rated for fault				PE (ground/earth)
6	30	2				CP (Control pilot)
7	30	2				PP (Proximity) [d] or CS (Connection switch) [d]

[a] In the following country, the branch circuit overcurrent protection is based upon 125 % of the device rating: US.

[b] For single phase charging, contacts 1 and 4 shall be used.

[c] Unused contacts need not be installed. Not provided for Standard Sheets 2-IIIa and 2-IIIb.

[d] Not provided for Standard Sheet 2-IIIa.

[e] For single phase system supply phase to phase this contact can be used for L2 (mains 2).

[f] Position number does not refer to the location and/or identification of the contact in the accessory.

6.3 DC Interface

Not applicable

6.4 Combined interface

Not applicable.

Addition:

Add the following new subclause:

6.201 Communication and control pilot function

The control pilot and proximity detection or connection contacts are intended to be used in accordance with IEC 61851-1:2017.

7 Classification of accessories

Clause 7 of IEC 62196-1:2022 applies, except as follows:

7.4 According to electrical operation

Replacement:

Replace the existing text of IEC 62196-1:2022, 7.4 with the following:

– suitable for making and breaking an electrical circuit under load for 32 A configurations types 1 and 3;
– not suitable for making and breaking an electrical circuit under load for configuration type 2;
– not suitable for making and breaking an electrical circuit under load for 63 A configuration type 3.

NOTE Communication circuits according to this document are deemed not to make or break load as a result of this Subclause 7.4.

7.5 According to interface

Replacement:

Replace the existing text of IEC 62196-1:2022, 7.5 with the following:

Interface is specified in Clause 6:

– basic type.

Addition:

Add the following new subclause:

7.201 According to the standard sheet used

– configuration type 1;
– configuration type 2;
– configuration type 3.

8 Marking

Clause 8 of IEC 62196-1:2022 applies.

9 Dimensions

Clause 9 of IEC 62196-1:2022 applies, except as follows:

Addition:

Add the following new subclause:

9.201 Standard sheets

Accessories shall comply with the relevant standard sheets as specified below and in Table 203:

– Configuration type 1
  - 32 A, 250 V single-phase vehicle couplers: Standard Sheet 2-I.
  - Optional latching system: Standard Sheet 2-Ia.

NOTE In the following countries, Standard Sheets 2-I and 2-Ia may be applied to vehicle couplers with rated current up to 80 A: US, KR.

– Configuration type 2
  - 63 A, 480 V three-phase or 250 V, 70 A single-phase accessories: Standard Sheets 2-II, IIa, IIb, IIc, IId, IIe, IIf, IIg and IIh, as specified in Table 204.

– Configuration type 3
  - 16 A, 250 V single-phase accessories with one pilot: Standard Sheet 2-IIIa;
  - 32 A, 250 V single-phase accessories with two pilots: Standard Sheet 2-IIIb;
  - 63 A, 480 V three-phase accessories with two pilots: Standard Sheet 2-IIIc;
  - Latching means and packaging room: Standard Sheet 2-IIId.

Table 203 – Configuration types and standard sheets

Configuration type	**Standard sheet**	**Applicable accessories**	**Rated voltage** V	**Rated current** A	**Phase**
1	2-I	Vehicle couplers	250	32	Single phase
2	2-II	Accessories	250	70	Single phase
			480	63	Three phase
3	2-III	Accessories	250	16	Single phase
			250	32	Single phase
			480	63	Three phase

10 Protection against electric shock

Clause 10 of IEC 62196-1:2022 applies.

11 Size and colour of protective earthing and neutral conductors

Replacement:

Replace the existing text of IEC 62196-1:2022, Clause 11 with the following:

The core connected to the earthing terminal shall be identified by the colour combination green-and-yellow. The nominal cross-sectional area of the earthing conductor and of the neutral conductor, if any, shall be at least equal to that of the phase conductors.

NOTE In the following countries, the colour green may be used to identify the earthing conductor: JP, US, CA, KR, BR.

12 Provisions for earthing

Clause 12 of IEC 62196-1:2022 applies.

13 Terminals

Clause 13 of IEC 62196-1:2022 applies, except as follows.

Addition:

Add the following new subclause:

13.201 Wire connection of components, for example coding resistors, may be rewireable or non-rewireable.

14 Interlocks

Clause 14 of IEC 62196-1:2022 applies.

15 Resistance to ageing of rubber and thermoplastic material

Clause 15 of IEC 62196-1:2022 applies.

16 General construction

Clause 16 of IEC 62196-1:2022 applies.

17 Construction of EV socket-outlets – General

Clause 17 of IEC 62196-1:2022 applies.

18 Construction of EV plugs and vehicle connectors

Clause 18 of IEC 62196-1:2022 applies.

19 Construction of vehicle inlets

Clause 19 of IEC 62196-1:2022 applies.

20 Degrees of protection

Clause 20 of IEC 62196-1:2022 applies.

21 Insulation resistance and dielectric strength

Clause 21 of IEC 62196-1:2022 applies.

22 Breaking capacity

Clause 22 of IEC 62196-1:2022 applies.