IEC 62196-2

Edition 2.0 2016-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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 et d'interchangeabilité pour les appareils à broches et alvéoles pour courant alternatif

IEC 62196-2:2016-02(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.120.30; 43.120

ISBN 978-2-8322-3154-8

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories

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International Standard 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.

This second edition cancels and replaces the first edition published in 2011 and constitutes a technical revision.

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

a) Standard sheets for configurations type 2 and type 3 have been updated.

b) Configuration type 2 is now available with optional shutter.

The text of this standard is based on the following documents:

CDV	Report on voting
23H/324/CDV	23H/342/RVC

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

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

A list of all the parts in the IEC 62196 series, 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 part of IEC 62196 is to be read in conjunction with IEC 62196-1:2014. The clauses of the particular requirements in Part 2 supplement or modify the corresponding clauses in Part 1. Where the text indicates "addition" to or "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 this standard. Where no change is necessary, the words "Clause X of IEC 62196-1:2014 is applicable" are used.

In this standard, 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 publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

INTRODUCTION

Responding to global challenges of CO_2 reduction and energy security, the automobile industries have been accelerating the development and commercialization of electric vehicles and hybrid electric vehicles. In addition to the prevailing hybrid electric vehicles, battery electric vehicles including plug-in hybrid electric vehicles are going to be mass-marketed. To support the diffusion of such vehicles, this standard provides the standard interface configurations of a.c. vehicle couplers and accessories to be used in conductive charging of electric vehicles, taking the most frequent charging situations into consideration.

IEC 62196 is divided into several parts:

Part 1: General requirements

Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories

Part 3: Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers

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

Part 2: Dimensional compatibility and interchangeability requirements for a.c. pin and contact-tube accessories

1 Scope

This part of IEC 62196 applies to plugs, socket-outlets, vehicle connectors and vehicle inlets with pins and contact-tubes of standardized configurations, herein referred to as accessories. They have a nominal rated operating voltage not exceeding 480 V a.c., 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 part of IEC 62196 covers the basic interface accessories for vehicle supply as specified in IEC 62196-1, and intended for use in conductive charging systems for circuits specified in IEC 61851-1:2010.

NOTE 1 Electric road vehicles (EV) implies all road vehicles, including plug-in hybrid road vehicles (PHEV), that derive all or part of their energy from RESS.

These accessories are intended to be used for circuits specified in IEC 61851-1:2010 which operate at different voltages and frequencies and which may include extra-low voltage (ELV) and communication signals.

These accessories may be used for bidirectional power transfer (under consideration).

This standard applies to accessories to be used in an ambient temperature between –30 °C and +50 °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 inlet and vehicle connector to this standard are intended to be used for charging in modes 1, 2 and 3, cases B and C. The socket-outlets and plugs covered by this standard are intended to be used for charging mode 3 only, case A and B.

The modes and permissible connections are specified in IEC 62196-1:2014.

2 Normative references

Clause 2 of IEC 62196-1:2014 applies except as follows:

Addition:

IEC 62196-1:2014, *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 62196-1:2014 applies.

4 General

Clause 4 of IEC 62196-1:2014 applies.

5 Ratings

Clause 5 of IEC 62196-1:2014 applies except as follows:

5.1 *Replacement:*

Rated operating voltages:

30 V (signal or control purposes only);
250 V a.c.
480 V a.c.

5.2 *Replacement:*

The rated currents are:

2 A (signal or control purposes only)
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 countries, 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 62196-1:2014 applies except as follows:

6.1 *Replacement:*

This Clause 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 a.c. three-phase and up to 70 A a.c. 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 *Replacement:*

There is one type of vehicle inlet:

– basic

6.3 *Replacement:*

There is one type of vehicle connector:

– basic

6.4 Not applicable.

6.5 *Replacement:*

The basic interface may contain up to 7 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 Tables 201 and 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 plug shall only mate with the corresponding type of 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, socket-outlet and 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, socket-outlet and 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]	a.c.	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 countries, 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 a.c.	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 countries, 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 to 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.

6.6 *Not applicable.*

6.7 *Not applicable.*

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 61851-1:2010.

7 Classification of accessories

Clause 7 of IEC 62196-1:2014 applies except as follows:

7.4 According to electrical operation

Replacement:

– 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 configurations 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 standard are deemed not to make or break load as a result of this clause.

7.5 According to interface

Replacement:

Interface is specified in Clause 6.

– Basic type.

7.201 According to the Standard Sheet used

– Configuration type 1;
– Configuration type 2;
– Configuration type 3.

8 Marking

Clause 8 of IEC 62196-1:2014 applies.

9 Dimensions

Clause 9 of IEC 62196-1:2014 applies except as follows:

9.1 *Replacement:*

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, the standard sheets 2-I and 2-Ia may be applied to vehicle couplers with rated current up to 80 A: US.

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.

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 62196-1:2014 applies.

11 Size and colour of protective earthing conductors

Replacement:

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.

12 Provision for earthing

Clause 12 of IEC 62196-1:2014 applies.

13 Terminals

Clause 13 of IEC 62196-1:2014 applies except as follows.

Additional subclause:

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

14 Interlocks

Clause 14 of IEC 62196-1:2014 applies.

15 Resistance to ageing of rubber and thermoplastic material

Clause 15 of IEC 62196-1:2014 applies.

16 General construction

Clause 16 of IEC 62196-1:2014 applies.

17 Construction of socket-outlets

Clause 17 of IEC 62196-1:2014 applies.

18 Construction of plugs and vehicle connectors

Clause 18 of IEC 62196-1:2014 applies.

19 Construction of vehicle inlets

Clause 19 of IEC 62196-1:2014 applies.

20 Degrees of protection

Clause 20 of IEC 62196-1:2014 applies.

21 Insulation resistance and dielectric strength

Clause 21 of IEC 62196-1:2014 applies.

22 Breaking capacity

Clause 22 of IEC 62196-1:2014 applies.

23 Normal operation

Clause 23 of IEC 62196-1:2014 applies.

24 Temperature rise

Clause 24 of 62196-1:2014 applies except as follows:

24.1 *Addition, after the seventh paragraph:*

For accessories dependent upon a resistor coding to define the accessory's assigned current rating, the test shall be repeated using a set of samples for each resistor coding value and tested at the maximum current corresponding to that resistor coding value.

25 Flexible cables and their connection

Clause 25 of IEC 62196-1:2014 applies.

26 Mechanical strength

Clause 26 of IEC 62196-1:2014 applies.

27 Screws, current-carrying parts and connections

Clause 27 of IEC 62196-1:2014 applies.

28 Creepage distances, clearances and distances

Clause 28 of IEC 62196-1:2014 applies.

29 Resistance to heat, to fire and to tracking

Clause 29 of IEC 62196-1:2014 applies.

30 Corrosion and resistance to rusting

Clause 30 of IEC 62196-1:2014 applies.