

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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Fiches, socles de prise de courant, prises mobiles de véhicule et socles de connecteur de véhicule – Charge conductive des véhicules électriques – Partie 3: Exigences dimensionnelles de compatibilité et d’interchangeabilité pour les connecteurs de véhicule à broches et alvéoles pour courant continu et pour courants alternatif et continu



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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

FOREWORD

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International Standard IEC 62196-3 has been prepared by subcommittee 23H: Plugs, socket-outlets and couplers for industrial and similar applications, and for electric vehicles, of IEC technical committee 23: Electrical accessories.

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

FDIS	Report on voting
23H/303/FDIS	23H/306/RVD

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. The clauses of the particular requirements in Part 3 supplement or modify the corresponding clauses in Part 1. Where the text 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.

Subclauses, figures, tables or notes which are additional to those in IEC 62196-1 are numbered starting from 301.

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 web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
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INTRODUCTION

Responding to global challenges of CO₂ 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 vehicle couplers to be used in conductive charging of electric vehicles, taking the most frequent charging situations into consideration.

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

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

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

1 Scope

This part of IEC 62196 is applicable to vehicle couplers with pins and contact-tubes of standardized configuration, herein also referred to as “accessories”, intended for use in electric vehicle conductive charging systems which incorporate control means, with rated operating voltage up to 1 500 V d.c. and rated current up to 250 A, and 1 000 V a.c. and rated current up to 250 A.

This part of IEC 62196 applies to high power d.c. interfaces and combined a.c./d.c. interfaces of vehicle couplers specified in IEC 62196-1:2014, and intended for use in conductive charging systems for circuits specified in IEC 61851-1:2010, and IEC 61851-23:2014.

The d.c. vehicle connectors covered by this part of the standard are used only in charging mode 4, according to Case C in Clause 6.2 of IEC 61851-1:2010, Figure 3 in Clause 6.3.1 of IEC 61851-1:2010 and IEC 62196-2:2011.

The d.c. vehicle inlets covered by this part of the standard are used only in charging mode 4, according to Case C in Clause 6.2 of IEC 61851-1:2010, Figure 3 in Clause 6.3.1 of IEC 61851-1:2010.

These vehicle couplers are intended to be used for circuits similar to those specified in IEC 61851-23 which operate at different voltages and which may include ELV and communication signals.

This part of IEC 62196 applies to the vehicle couplers to be used in an ambient temperature of between –30 °C and +50 °C.

NOTE 1 In some countries, other requirements may apply.

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

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

2 Normative references

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

Additional normative reference:

IEC 62196-2:2011, *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*

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.

6 Connection between the power supply and the electric vehicle

Clause 6 of IEC 62196-1:2014 applies, except as follows:

6.4 Universal interface

Not applicable.

6.5 Basic interface iTeh STANDARD PREVIEW (standards.iteh.ai)

Not applicable.

6.6 D.C. configurations

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Replacement:

For all d.c. configurations, the d.c. interface may contain up to 12 power or signal contacts, with only one physical configuration of contact positions. The electrical ratings and their function are described in Table 4 of 62196-1. They shall be used in a system according to IEC 61851-23:2014, Annex AA “D.C. electric vehicle charging station of System A” or Annex BB “D.C. Electric vehicle charging station of System B” respectively. See the corresponding standard sheets for additional interface details.

6.7 Contact sequencing

Addition:

For all d.c. interfaces, the contact sequence during the connection process shall be:

- Protective Earth (if any)
- d.c. power contacts
- Isolation monitor contacts:

NOTE 1 if provided, isolation monitor contacts shall mate before or simultaneously with the control pilot contact.

- Proximity detection or connection switch contact

NOTE 2 if provided, proximity detection or connection switch contacts shall mate before or simultaneously with the control pilot contact.

- Control pilot contact

During disconnection the order shall be reversed.

Additional subclause:

6.301 Configuration EE and FF combined interface

A combined interface extends the use of a basic interface for a.c. and d.c. charging. D.C. charging can be achieved by providing additional d.c. power contacts to supply d.c. energy to the electric vehicle.

The basic portion of the combined vehicle inlet can be used with a basic connector for a.c. charging only or a combined vehicle connector for d.c. charging.

Combined couplers shall only be used for d.c. charging with the “d.c. electric vehicle charging station of System C” described in IEC 61851-23:2014, Annex CC.

General requirements and ratings for all contacts are given in IEC 62196-1:2014, Table 5.

If the a.c. or d.c. ratings of a mating connector and inlet differ, the coupler (mating pair) shall be used at the lower rating of either the vehicle connector or vehicle inlet of the mating accessory.

Ratings and requirements for the use of the combined interface with a.c. are defined in IEC 62196-2:2011.

Electric vehicles with a combined vehicle inlet shall withstand a.c. voltage at the power contacts of the basic portion.

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NOTE This requirement will be withdrawn when an equivalent update is included in ISO 17409.

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Table 301 – Compatibility of mating accessories at vehicle

		Vehicle connector								
		Type 1	Type 2	Type 3	Configuration AA	Configuration BB	Configuration EE	Configuration FF	Universal, high power a.c.	Universal, high power d.c.
Vehicle inlet	Type 1	Yes	-	-	-	-	-	-	-	-
	Type 2	-	Yes	-	-	-	-	-	-	-
	Type 3	-	-	Yes	-	-	-	-	-	-
	Configuration AA	-	-	-	Yes	-	-	-	-	-
	Configuration BB	-	-	-	-	Yes	-	-	-	-
	Configuration EE	Yes	-	-	-	-	Yes	-	-	-
	Configuration FF	-	Yes	-	-	-	-	Yes	-	-
	Universal, high power a.c.	-	-	-	-	-	-	-	Yes	-
Universal, high power 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 standards sheets.

NOTE 3 For Universal high power a.c. and Universal high power d.c., refer to IEC 62196-1:2014.

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7 Classification of accessories

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

7.1 Replacement:

- Vehicle connectors,
- Vehicle inlets.

7.5 Replacement:

As specified in Clause 6 and IEC 61851-1:2010:

- Combined interface

Additional subclause:

7.301 According to the standard sheets used:

- Configuration AA
- Configuration BB
- Configuration EE
a.c. corresponding to Type 1 in IEC 62196-2:2011 and d.c.
- Configuration FF

a.c. corresponding to Type 2 in IEC 62196-2:2011 and d.c.

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:

The vehicle connector and vehicle inlet shall comply with the relevant configuration shown in Table 302:

Table 302 – Interface Overview

Configuration	Dimensions described in	Max. Rated Voltage V d.c.	Max. Rated Current A	Shall only be used with d.c. charging station according to
AA	Standard Sheets 3-I	600	200	IEC 61851-23:2014, Annex AA
BB	Standard Sheets 3-II	750	250	IEC 61851-23:2014, Annex BB
EE	Standard Sheets 3-III	600	200	IEC 61851-23:2014, Annex CC
FF	Standard Sheets 3-IV	1 000	200	IEC 61851-23:2014, Annex CC

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10 Protection against electric shock

Clause 10 of IEC 62196-1:2014 applies, except as follows:

Additional subclauses:

10.301 For configuration AA, vehicle couplers shall be used only with the isolated d.c. electric vehicle charging station as specified in IEC 61851-23.

10.302 For configuration BB, vehicle couplers shall be used only with either isolated or non-isolated d.c. electric vehicle charging station as specified in IEC 61851-23.

10.303 For configurations EE and FF, vehicle couplers shall be used with either isolated or non-isolated d.c. electric vehicle charging station as specified in IEC 61851-23.

11 Size and colour of earthing conductors

Clause 11 of IEC 62196-1:2014 applies.

12 Provision for earthing

Clause 12 of IEC 62196-1:2014 applies, except as follows:

12.1 Replacement:

Accessories shall be provided with a protective earthing contact and earthing terminal in case that the vehicle is connected galvanically to the mains through this accessory. Protective earthing contacts shall be directly and reliably connected to the protective earthing terminals.

NOTE if the vehicle is connected to the electric vehicle charging station with the insulating device between the vehicle and the mains (e.g. insulating transformer), the vehicle is deemed not to be galvanically connected.

13 Terminals

Clause 13 of IEC 62196-1:2014 applies.

14 Interlocks

Clause 14 of IEC 62196-1:2014 applies, except as follows:

Additional subclause:

14.301 Latching function

Accessories shall be provided with a latching device to prevent the connection to be separated unintentionally or by unauthorized persons.

The interlock function shall be performed by the proper functioning of the latching device.

A means shall be provided to indicate that the interlock is properly engaged.

Compliance is checked by inspection and manual test.

15 Resistance to aging of rubber and thermoplastic material

Clause 15 of IEC 62196-1:2014 applies.

16 General construction

Clause 16 of IEC 62196-1:2014 applies, except as follows.

16.15 Replacement of the first paragraph by:

The force to insert and withdraw a vehicle connector shall be less than 100 N. Means to facilitate the insertion and withdrawal of the vehicle connector from the vehicle inlet may be provided. If a vehicle coupler is equipped with an assist device to reduce this force (e.g. mechanical assist device), the operating force of assist device shall be less than 100 N.

17 Construction of socket-outlets

Clause 17 of IEC 62196-1:2014 does not apply.

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, except as follows:

22.3 Replacement:

D.C. accessories or the d.c. portions of combined a.c./d.c. accessories are not required to be tested in accordance with 22.3 of 62196-1:2014.

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23 Normal operation

Clause 23 of IEC 62196-1:2014 applies, except as follows:

23.2 Addition:

For d.c. vehicle inlets and vehicle connectors the maximum number of operation cycles is 10 000 with no electrical load. In case d.c. vehicle inlets contain an a.c. part, these shall be tested separately with new accessories.

24 Temperature rise

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

24.1 Addition, after the first paragraph:

A thermal cut-out in the vehicle connector is optional for d.c. charging.

Replacement of the fourth paragraph by:

The test current is a direct or alternating current of the value shown in Table 18 of IEC 62196-1:2014. For the purposes of the temperature rise test, any thermal cut-out device shall be short circuited (i.e. the test results shall be acceptable without relying on the thermal cut-out).

25 Flexible cables and their connection

Clause 25 of IEC 62196-1:2014 applies except as follows:

Additional subclause:

25.301 Accessories not suitable for making and breaking an electric circuit under load

Accessories that are not suitable for making and breaking under load shall be submitted to the additional following test:

Non-rewirable accessories are tested as delivered.

Rewirable accessories are tested with the maximum and minimum size cables recommended by the manufacturer.

Conductors of the cable of rewirable accessories are introduced into the terminals, the terminal screws being tightened just sufficiently to prevent the conductors from easily changing their position.

The cable anchorage is used in the normal way, clamping screws being tightened with a torque equal to two-thirds of that specified in IEC 62196-1:2014 Clause 27.1. After reassembly of the sample with cable glands, if any, in position, the component parts shall fit snugly and it shall not be possible to push the cable into the sample to any appreciable extent.

The sample is fixed in the test apparatus so that the axis of the cable is vertical where it enters the sample. <https://standards.iteh.ai/catalog/standards/sist/f3f02e04-1d99-4244-9216-c97b04e58b01/iec-62196-3-2014>

The cable is then subjected once to a pull of 750 N. The pull is applied without jerks for a duration of 1 min.

Immediately afterwards, the cable is subjected to a torque, of the value specified in IEC 62196-1:2014 Table 19, for 1 min.

During the tests, the cable shall not be damaged.

After the tests, the cable shall not have been displaced by more than the values indicated in IEC 62196-1:2014 Table 19. For rewirable accessories, the ends of the conductors shall not have moved noticeably in the terminals; for non-rewirable accessories, there shall be no break in the electrical connections.

For the measurement of the longitudinal displacement, a mark is made on the cable at a distance of approximately 2 cm from the end of the sample or the cable anchorage before starting the tests. If, for non-rewirable accessories, there is no definite end to the sample, an additional mark is made on the body of the sample.

After the tests, the displacement of the mark on the cable in relation to the sample or the cable anchorage is measured.

26 Mechanical strength

Clause 26 of IEC 62196-1:2014 applies.