

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 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**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

FOREWORD

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International Standard IEC 62196-2 has been prepared by IEC subcommittee 23H: Industrial plugs and socket-outlets, of IEC technical committee 23: Electrical accessories.

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

FDIS	Report on voting
23H/267/FDIS	23H/270/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 2 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. Where no change is necessary, the words "This clause of Part 1 is applicable" are used.

In this standard, the following print types are used:

- *compliance statements: in italic 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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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 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 pin and contact-tube accessories for dedicated d.c. charging or for combined a.c./d.c. charging (under consideration)

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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

1 Scope

This standard 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 500 V a.c., 50 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 standard 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.

Electric vehicles covers all road vehicles, including plug-in hybrid road vehicles (PHEV), that derive all or part of their energy from on-board batteries.

NOTE 1 These accessories may provide a contact that can be used for the proximity contact function.

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 ELV and communication signals.

These accessories may be used for bidirectional energy transmission (under consideration).

This standard applies to the accessories to be used in an ambient temperature of between – 30 °C and + 50 °C.

NOTE 2 In the following country, other requirements may apply: FI.

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 Part 1.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

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

3 Terms and definitions

This clause of Part 1 is applicable.

4 General

This clause of Part 1 is applicable, except as follows:

Addition at the end of the subclause:

Accessories according to this standard are intended for modes 1, 2 and 3, cases A to C. The socket-outlets and plugs covered by this standard shall be used only in mode 3.

5 Ratings

This clause of Part 1 is applicable except as follows:

5.1 Replacement:

Rated operating voltage range:

0 to 30 V (signal or control purposes only);

200 to 250 V a.c.

380 to 480 V a.c.

5.2 Replacement:

2 A (signal or control purposes only)

13 A single phase

16 A single and three-phase

20 A single and three-phase

30-32 A single and three-phase

60-63 A single and three-phase

70 A single phase, only

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

6 Connection between the power supply and the electric vehicle

This clause of Part 1 is applicable except as follows:

6.1 Replacement:

This section 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.

NOTE In the following country, Mode 1 will not be allowed: UK.

6.2 Replacement:

There shall be the following type of vehicle inlets:

basic

6.3 Replacement:

There shall be the following type of vehicle connectors:

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 Table 101. 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,
 - 380-480 V, 13 A or 20 A or 32 A or 63 A, three-phase.
- configuration Type 3 vehicle coupler is rated:
 - 250 V, 16 A or 32 A, single phase,
 - 380-480 V, 32 A, or 63 A three-phase.
- Configuration Type 3 socket-outlet and plug are rated:
 - 250 V, 16 A or 32 A single phase,
 - 380-480 V, 32 A, or 63 A three-phase.

Table 101 – 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)

^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: USA.

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

Table 102 – Overview of the basic vehicle interface, configuration Types 2 and 3, three phase or single phase

Position number ^f	Three phase			Single phase		Functions
	U_{max}	I_{max} ^a		I_{max} ^a		
	V a.c.	A		A		
		Type 2	Type 3	Type 2 ^b	Type 3	
1	480	63	63	70	63	L1 (mains 1) ^b
2	480	63	63	- ^c	- ^c	L2 (mains 2)
3	480	63	63	- ^c	- ^c	L3 (mains 3)
4	480	63	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: USA.

^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 *This subclause of Part 1 is not applicable.*

6.101 Communication and control pilot function

The control pilot and proximity detection, or connection contacts shall be used in accordance with IEC 61851-1:2010.

7 Classification of accessories

This clause of Part 1 is applicable except as follows:

7.4 Replacement:

According to electrical operation

- Suitable for making and breaking an electrical circuit under load for configuration Types 1 and 3 up to 32 A;
- Not suitable for making and breaking an electrical circuit under load for configurations Type 2 rated 63 A and 70 A and Type 3, rated 63 A.

NOTE Communication circuits to this standard are deemed not to make or break load in the purpose of this clause.

7.5 Replacement:

According to the function as specified in Clause 6

- Basic type only.

Addition:

7.101 According to the Standard Sheet used

- Configuration Type 1;
- Configuration Type 2;
- Configuration Type 3.

8 Marking

This clause of Part 1 is applicable.

9 Dimensions

This clause of Part 1 is applicable except as follows:

9.1 Replacement:

Accessories shall comply with the relevant standard sheets as specified below and in Table 103:

Configuration Type 1

- Vehicle couplers not exceeding 250 V, 32 A single phase: standard sheet 2-I.
- Optional locking system: standard sheet 2-Ia.

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

Configuration Type 2

- Accessories not exceeding 480 V, 63 A three-phase or 70 A single phase: standard sheets 2-II, IIa, IIb, IIc, II d, IIe, II f, IIg and IIh.

Configuration Type 3

- Accessories not exceeding 250 V, 16 A single phase, one pilot: standard sheet 2-IIIa;
- Accessories not exceeding 250 V, 32 A single phase, two pilots: standard sheet 2-IIIb;

- Accessories not exceeding 480 V, 63 A three phase, two pilots: standard sheet 2-IIIc;
- Retaining means and packaging room: standard sheet 2-IIId.

Table 103 – Configuration types and standard sheets

Configuration Type	Standard Sheet	Applicable accessories	Rated voltage V	Rated current A	Phase
1	2-I	Vehicle couplers	Not exceeding 250	32	Single-phase
2	2-II	Accessories	Not exceeding 480	70	Single-phase
				63	Three-phase
3	2-III	Accessories	Not exceeding 250	16	Single-phase
			Not exceeding 250	32	Single-phase
			Not exceeding 480	63	Three-phase

10 Protection against electric shock

This clause of Part 1 is applicable except as follows:

Addition:

10.101 Accessories of configuration Type 3 shall be provided with shutters. Accessories of other configuration types may be provided with shutters.

Compliance is checked by inspection.

11 Size and colour of earthing conductors

This clause of Part 1 is applicable except as follows:

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, USA, CA.

12 Provision for earthing

This clause of Part 1 is applicable.

13 Terminals

This clause of Part 1 is applicable.

14 Interlocks

This clause of Part 1 is applicable for configuration Type 1.

Addition for configuration Types 2 and 3:

Accessories shall be provided with a latching device according to standard sheets 2-II or 2-IIIId 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 ageing of rubber and thermoplastic material

This clause of Part 1 is applicable.

16 General construction

This clause of Part 1 is applicable.

17 Construction of socket-outlets

This clause of Part 1 is applicable.

18 Construction of plugs and vehicle connectors

This clause of Part 1 is applicable.

19 Construction of vehicle inlets

This clause of Part 1 is applicable.

20 Degrees of protection

This clause of Part 1 is applicable.

21 Insulation resistance and dielectric strength

This clause of Part 1 is applicable.

22 Breaking capacity

This clause of Part 1 is applicable.