

# INTERNATIONAL STANDARD

**IEC**  
**62196-1**

First edition  
2003-04

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**Plugs, socket-outlets, vehicle couplers  
and vehicle inlets –  
Conductive charging of electric vehicles –**

**Part 1:  
Charging of electric vehicles up to 250 A a.c.  
and 400 A d.c.**

*Fiches, socles de prise de courant, prises mobiles  
et socles de connecteur pour véhicule –  
Charge conductive des véhicules électriques –*

*Partie 1:  
Charge des véhicules électriques jusqu'à 250 A c.a.  
et 400 A c.c.*



Reference number  
IEC 62196-1:2003(E)

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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE **XB**

*For price, see current catalogue*

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

#### Part 1: Charging of electric vehicles up to 250 A a.c. and 400 A d.c.

#### FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organisation for standardisation comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardisation in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and nongovernmental organisations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organisation for Standardisation (ISO) in accordance with conditions determined by agreement between the two organisations.
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International Standard IEC 62196-1 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/132/FDIS	23H/135/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.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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- withdrawn;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

A bilingual edition of this standard may be issued at a later date.

## INTRODUCTION

IEC 61851-1 specifies electric vehicle conductive charging equipment. This International Standard, referred to as the IEC 60309 series in IEC 61851-1, specifies the requirements for plugs, socket-outlets, connectors, inlets and cable assemblies as described in IEC 61851-1. 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 International Standard may be published in several parts, as necessary, including this Part 1, comprising clauses of a general character, and subsequent parts, presenting particular requirements for individual types.

Withdrawal

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

## Part 1: Charging of electric vehicles up to 250 A a.c. and 400 A d.c.

### 1 Scope

This part of IEC 62196 is applicable to plugs, socket-outlets, connectors, inlets and cable assemblies for electric vehicles, intended for use in conductive charging systems which incorporate control means, with a rated operating voltage not exceeding:

- 690 V a.c., 50 – 60 Hz, at a rated current not exceeding 250 A;
- 600 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 which operate at different voltages and frequencies and which may include ELV and communication signals.

These accessories and cable assemblies are to be used in an ambient temperature of between  $-30\text{ }^{\circ}\text{C}$  and  $+50\text{ }^{\circ}\text{C}$ . 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 EV's. These modes are defined in IEC 61851-1. These definitions and a description of the types of connection (cases A, B and C), also described in IEC 61851-1, are reproduced herein as Annex A.

Table 1 illustrates the types of accessories (B,  $U_{32}$ ,  $U_A$ ,  $U_D$ ) permitted for each charging situation (mode and case) and identifies where it is mandatory to use the accessories covered by this standard. These are indicated by the entries in the columns headed "62196" in Table 1.

The table also describes situations in which either an accessory covered by this standard, or other standardized accessories, are permitted to be used. They are identified by an entry in the column headed "62196" and the word "Any" under the column headed "Type".

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 Table 1 by the word "Any" under the column headed "Type" and with no corresponding entry under the column headed "62196".

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.



**Table 1 – Modes and permissible connections specified in IEC 61851-1**

Mode	Amps	Phases	Plug & socket					EV connector & inlet					Comments				
			Power pins used & prot. earth	Control pins incl. pilot	Type	62196	Case	In line control box	Power pins used & prot. earth	Control pins incl. pilot	Type	62196		Case			
1	16	1	1+N, or 2	None	Any	[shaded]	A	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	A	See Note 1			
					Any		B						B or U <sub>32</sub>		B		
		3	3 + N	None	Any	[shaded]	A	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	A			
					Any		B							B or U <sub>32</sub>		B	
2	32	1	1+N, or 2	None	Any	[shaded]	B	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	B or U <sub>32</sub>	B	Uses in-line control box		
					Any		B						B or U <sub>32</sub>	B			
		3	3 + N	None	Any	[shaded]	B	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	B or U <sub>32</sub>	B	Uses in-line control box	
					Any		B							B or U <sub>32</sub>	B		
3	32	1	1+N, or 2	4	[shaded]	[shaded]	A	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	B or U <sub>32</sub>	A			
							B						B				
		3	3 + N	4	[shaded]	[shaded]	[shaded]	A	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	B or U <sub>32</sub>	A		
								B						B			
	250	1	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	U <sub>A</sub>	C		
														C			
		3	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	U <sub>A</sub>	C	
															C		
4	400	-	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	[shaded]	U <sub>D</sub>	C		
														C			

NOTE 1 Restrictions regarding load less than 16 A should be recognized by the vehicle maker.

NOTE 2 In the column headed "62196", the items listed are defined as:  
 B Basic  
 U<sub>32</sub> Universal interface rated for 32 A a.c. only  
 U<sub>A</sub> Universal interface rated for 32/250 A a.c. only  
 U<sub>D</sub> Universal interface prepared for 32/400 A d.c. only

NOTE 3 In the column headed "Type", the word "Any" indicates that any IEC standard plug/socket-outlet interface can be used.

NOTE 4 Either "L<sub>1</sub> with N" or "L<sub>1</sub> with L<sub>2</sub>" are used for single-phase to match the supply.

NOTE 5 Earth-contact is mandatory in all accessories, pilot contact is mandatory in accessories in modes 2, 3, and 4. The other contacts are provided as required by the user.

## 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, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60227 (all parts): *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60228:1978, *Conductors of insulated cables*

IEC 60245-4:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60269-1:1998, *Low-voltage fuses – Part 1: General requirements*

IEC 60269-2:1986, *Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorised persons (fuses mainly for industrial application)*

IEC 60529, *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests<sup>1</sup>*

IEC 60664-3:1992, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coatings to achieve insulation coordination of printed board assemblies*

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

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<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 60999-2:1999, *Connecting devices – Safety requirements for screw-type and screwless-type clamping units for electrical copper conductors – Part 2: Particular requirements for conductors from 35 mm<sup>2</sup> up to 300 mm<sup>2</sup>*

IEC 61851-1:2001, *Electric vehicle conductive charging system – Part 1: General requirements*

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<sup>1</sup> There exists a consolidated edition 1.2 (2002) including edition 1.0 and its Amendments 1 (2000) and 2 (2002).