TEST REPORT
EN IEC 61851-1
Electric vehicle conductive charging system - Part 1: General requirements
EN IEC 62196-1
Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements
EN IEC 62196-2
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

Report Number.....:	KEYS241105047002LD-01
Date of issue..... :	November 12, 2024
Total number of pages.....	37 pages
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Approved by (name + signature)...:	Jason Zhan
Testing Laboratory Name.....:	Guangdong KEYS Testing Technology Co., Ltd.
Address.....:	Building 1, No.18, Shihuan Road, Dongcheng Subdistrict, Dongguan, Guangdong, China
Applicant's name.....:	Foshan Putaineng Charging Equipment Co., Ltd
Address.....:	206, Building 1, Baozhi Park, No. 15 Fu'an Avenue, Liandu Village, Leliu Street, Shunde District, Foshan, Guangdong, China
Manufacturer's name.....:	Foshan Putaineng Charging Equipment Co., Ltd
Address.....:	206, Building 1, Baozhi Park, No. 15 Fu'an Avenue, Liandu Village, Leliu Street, Shunde District, Foshan, Guangdong, China
Test specification:	
Standard..... :	EN IEC 61851-1:2019
	EN IEC 62196-2:2022
	EN IEC 62196-1:2022
Test procedure..... :	CE-LVD
Non-standard test method..... :	N/A
Test item description.....:	7kW AC EV Charger
Trade Mark..... :	N/A
Model/Type reference.....:	PAC—CE7002
Ratings..... :	AC220-230V, 50Hz, 32A, 7kW

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General disclaimer:

This report is only for applicant use. Any copying this report to/for any other person or entity, and use our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification

List of Attachments:

Appendix 1: Additional requirements for EV Plug and EV Connector according to EN IEC 62196-1:2022 and EN IEC 62196-2:2022.

No deviation exists between IEC 61851- 1:2019 and EN IEC 61851-1:2019, the TRF of IEC61851_1B was used in this report.

The product fulfils the requirements of EN IEC 61851-1:2019.

Appendix 2 : 2 pages of photos.

Summary of testing:

N/A

Testing location:

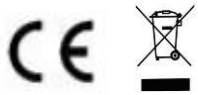
Guangdong KEYS Testing Technology Co., Ltd.

Building 1, No.18, Shihuan Road, Dongcheng Subdistrict, Dongguan, Guangdong, China

Copy of marking plate:

The artwork below may be only a draft.

7kW AC EV Charger
Model: PAC—CE7002
AC220-230V, 50Hz, 32A, 7kW



Foshan Putaineng Charging Equipment Co., Ltd
Made in china

Importer: xxx
Address: yyy

Note:

1. XXX means importer company name; YYY means importer company address information.
2. Marking on the packaging or in a document accompanying the electrical equipment is only acceptable if it is not possible to place such markings on the product.
3. The Height of CE logo shall not be less than 5 mm; Height of WEEE logo shall not be less than 7 mm.

Test item particulars.....	: See test report
Classification of installation and use.....	: Class I
Supply Connection.....	: Detach power cord connected to AC Mains
Possible test case verdicts:	
- test case does not apply to the test object.....	: N/A
- test object does meet the requirement.....	: P (Pass)
- test object does not meet the requirement.....	: F (Fail)
Testing.....	:
Date of receipt of test item.....	: November 5, 2024
Date (s) of performance of tests.....	: November 5, 2024 to November 12, 2024

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Name and address of factory (ies)..... : same as manufacturer

General product information:

1. The appliance/equipment is “7kW AC EV Charger” with model “PAC—CE7002”, as class I appliance .
2. All test model on PAC—CE7002.
3. . 3.The ambient temperature is 25℃.

EN IEC 61851-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
4. GENERAL REQUIREMENTS			P
	The EV supply equipment shall be so constructed that an EV can be connected to the EV supply equipment so that in normal conditions of use, the energy transfer operates safely, and its performance is reliable and minimises the risk of danger to the user or surroundings.		P
	Unless otherwise stated all tests indicated in this document are type tests.		P
	Unless otherwise stated, all tests required by this standard may be conducted on separate samples.		P
	Unless otherwise stated, each test is conducted once.		P
	Unless otherwise specified, all tests shall be carried out in a draught-free location and at an ambient temperature of 20°± 5 °C.		P
	The EV supply equipment shall be rated for one or more of standard nominal voltages and frequencies as given in IEC 60038.		P
	Assemblies for EV supply equipment shall comply with IEC TS 61439-7 with the exceptions or additions as indicated in Clause 13.		P
	The standard applies to equipment that is designed to be used at an altitude up to 2 000 m.		P
	For equipment designed to be used at altitudes above 2 000 m, it is necessary to take into account the reduction of the dielectric strength and the cooling effect of the air.		P
5. CLASSIFICATION			P
5.1	Characteristics of power supply and output 27		
5.1.1	Characteristics of power supply input		P
	The EV supply equipment shall be classified according to the supply network system that it is intended to be connected to:		P
	– EV supply equipment connected to AC supply network;		P
	– EV supply equipment connected to DC supply network.		N/A
	The EV supply equipment shall be classified according to the electric connection method:		P
	– Plug and cable connected;		P
	– Permanently connected.		P
5.1.2	Characteristics of power supply output		P
	The EV supply equipment shall be classified according to the type of current the		P
	EV supply equipment delivers:		
	– AC EV supply equipment;		P
	– DC EV supply equipment;		N/A
	– AC and/or DC EV supply equipment.		N/A
5.2	Normal environmental conditions		
	The EV supply equipment shall be classified according to the environmental conditions and use:		P
	– indoor use;		P

	– outdoor use.		P
	EN IEC 61851-1		
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
5.3	Special environmental conditions		
	The EV supply equipment may be classified according to their suitability for use in special environmental conditions other than those specified in this document, if declared so by the manufacturer.		N/A
5.4	Access		
	The EV supply equipment shall be classified according to the location they are intended for:		P
	– equipment for locations with restricted access;		N/A
	– equipment for locations with non-restricted access.		P
5.5	Mounting method		
	The EV supply equipment shall be classified according to the type of mounting:		P
	a) stationary equipment;		P
	– mounted on walls, poles or equivalent positions:		P
	•flush mounted;		N/A
	•surface mounted.		N/A
	– pole/column/pipe-mounted		N/A
	– floor mounted		N/A
	– ground mounted.		N/A
	b) non stationary equipment		N/A
	– portable equipment;		N/A
	– mobile equipment.		N/A
5.6	Protection against electric shock		
	The equipment shall be classified according to the protection against electric shock:		P
	– class I equipment;		P
	– class II equipment;		N/A
	– class III equipment.		N/A
5.7	Charging modes		
	The EV supply equipment shall be classified according to 6.2:		P
	Mode 1, Mode 2, Mode 3 or Mode 4	Mode 3	P
6. CHARGING MODES AND FUNCTIONS			P
6.1	General		
	Clause 6 describes the different charging modes and functions for energy transfer to EVs.		P
6.2	Charging Modes		
6.2.1	Mode 1		N/A
	Mode 1 is a method for the connection of an EV to a standard socket-outlet of an AC supply network, utilizing a cable and plug, both of which are not fitted with any supplementary pilot or auxiliary contacts.		N/A
	The rated values for current and voltage shall not exceed:		N/A
	– 16 A and 250 V AC, single-phase,		N/A
	– 16 A and 480 V AC, three-phase.		N/A
	EV supply equipment intended for Mode 1 charging shall provide a protective earthing conductor from the standard plug to the vehicle connector.		N/A

6.2.2	Mode 2		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Mode 2 is a method for the connection of an EV to a standard socket-outlet of an AC supply network utilizing an AC EV supply equipment with a cable and plug, with a control pilot function and system for personal protection against electric shock placed between the standard plug and the EV.		N/A
	The rated values for current and voltage shall not exceed:		N/A
	– 32 A and 250 V AC single-phase;		N/A
	– 32 A and 480 V AC three-phase.		N/A
	Current limitations are also subject to the standard socket-outlet ratings described in 9.2.		N/A
	EV supply equipment intended for Mode 2 charging shall provide a protective earthing conductor from the standard plug to the vehicle connector.		N/A
	Mode 2 equipment that is destined to be mounted on a wall but is detachable by the user, or to be used in a shock resistant enclosure shall use protection equipment as required by IEC 62752.		N/A
6.2.3	Mode 3		P
	Mode 3 is a method for the connection of an EV to an AC EV supply equipment permanently connected to an AC supply network, with a control pilot function that extends from the AC EV supply equipment to the EV.		P
	EV supply equipment intended for Mode 3 charging shall provide a protective earthing conductor to the EV socket-outlet and/or to the vehicle connector.		P
6.2.4	Mode 4		N/A
	Mode 4 is a method for the connection of an EV to an AC or DC supply network utilizing a DC EV supply equipment, with a control pilot function that extends from the DC EV supply equipment to the EV.		N/A
	Mode 4 equipment may be either permanently connected or connected by a cable and plug to the supply network.		N/A
	EV supply equipment intended for Mode 4 charging shall provide a protective earthing		N/A
6.3	Functions provided in Mode 2, 3 and 4		P
6.3.1	Mandatory functions in Modes 2, 3, and 4	Shall be checked in final use	P
6.3.1.1	General		
	The following control pilot functions shall be provided by the EV supply equipment:		P
	•Continuous continuity checking of the protective conductor according to 6.3.1.2;		P
	•Verification that the EV is properly connected to the EV supply equipment according to 6.3.1.3;		P
	•Energization of the power supply to the EV according to 6.3.1.4;		P

	•De-energization of the power supply to the EV according to 6.3.1.5;		P
	•Maximum allowable current according to 6.3.1.6.		P
EN IEC 61851-1			
Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	If EV supply equipment can supply more than one vehicle simultaneously, it shall ensure that the		P
	control pilot function performs the above functions independently at each connecting point.		P
	EV supply equipment designed for Mode 2 or Mode 3, using the control pilot conductor and utilizing accessories according to IEC 62196-2, shall be provided with control pilot function according to Annex A.		N/A
6.3.1.2	Continuous continuity checking of the protective conductor		P
	While charging in Mode 2, the electrical continuity of the protective earthing conductor between the ICCB and the respective EV contact shall be continuously monitored by the ICCB.		N/A
	While charging in Mode 3, the electrical continuity of the protective earthing conductor between the EV charging station and the respective EV contact shall be continuously monitored by the EV supply equipment.	Shall be checked in final use	N/A
	While charging in Mode 4, the electrical continuity of the protective conductor between the EV charging station and the respective EV contact shall be continuously monitored by the EV supply equipment.		P
	The EV supply equipment shall disconnect the supply to the EV in case of:	Shall be checked in final use	P
	•loss of electrical continuity of the protective conductor (i.e. open control pilot circuit), within 100 ms.		P
	•incapacity to verify the continuity of the protective conductor (e.g. short circuit between pilot wire and protective conductor), within 3 s.		P
6.3.1.3	Verification that the EV is properly connected to the EV supply equipment		P
	The EV supply equipment shall be able to determine that the EV is properly connected to the EV supply equipment.		P
6.3.1.4	Energization of the power supply to the EV		P
	The EV socket-outlet or the vehicle connector shall not be energized unless the control pilot function between EV supply equipment and EV has been established correctly with signal states allowing energization.		P
	The presence of such states does not imply that energy will be transferred between the EV supply equipment and the EV as this may be subject to other external conditions, e.g. energy management system.		P
	If the EV requests ventilation, the EV supply equipment shall only energize the system if such ventilation is provided by the installation or the premises.		P
6.3.1.5	De-energization of the power supply to the EV		N/A
	If the control pilot signal is interrupted the power supply to the EV shall be interrupted according to 6.3.1.2.		N/A

	If the control pilot signal status no longer allows energization, the power supply to the EV shall be interrupted but the control pilot signalling may remain in		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	operation.		
6.3.1.6	Maximum allowable current		N/A
	A means shall be provided to inform the EV of the value of the maximum current it is allowed to draw. The value of the maximum current permitted shall be transmitted and shall not exceed any of the following:		N/A
	•the rated output current of the EV supply equipment,		N/A
	•the rated current of the cable assembly.		N/A
	The transmitted value may change, without exceeding the maximum allowed current, to adapt to power limitations, e.g. for load management.		N/A
	The EV supply equipment may interrupt the energy supply if the current drawn by the EV exceeds the transmitted value.		N/A
6.3.2	Optional functions for Modes 2, 3 and 4		N/A
6.3.2.1	General		
	The optional functions that are implemented shall be indicated in the manual and shall fulfil the requirements of 6.3.2.		N/A
6.3.2.2	Ventilation during supply of energy		N/A
	EV supply equipment can exchange information with installation regarding the request and presence for ventilation.		N/A
6.3.2.3	Intentional and unintentional disconnection of the vehicle connector and/or the EV plug		N/A
	A mechanical or electromechanical means shall be provided to prevent intentional and unintentional disconnection under load of the vehicle connector and/or plug according to IEC 62196-1.		N/A
6.3.2.4	Mode 4 using the combined charging system		N/A
	The combined charging system as described in Annex CC of IEC 61851-23:2014 and ISO 17409 shall be so designed that:		N/A
	•AC chargeable EVs with a basic vehicle inlet do not require any means to protect the EV against DC voltage at the inlet.		N/A
	•AC EV supply equipment does not require any means to be self-protected against DC voltage coming from the EV.		N/A
	For DC charging, digital communication shall be established between the vehicle and the DC EV charging station that validates the DC energy transfer.		N/A
	The DC supply to the vehicle shall not be connected until such complete validation from the vehicle is achieved.		N/A
	A combined interface extends the use of a basic interface for AC and DC charging.		N/A

	DC charging can be achieved by using separate and additional DC power contacts to supply DC energy to the EV or by using power contacts placed at the position of the AC power contacts of a basic interface, if the vehicle connector and the vehicle inlet are both suitable for DC.		N/A
	The basic portion of the combined vehicle inlet can be used with a basic connector for AC charging only or with a		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	combined connector having separate contacts for AC or DC charging.		
	AC and DC power transfer shall not occur through the combined interface at the same time.		N/A
	Analysis and design of the EV supply equipment using a basic interface for DC shall apply a risk analysis according to IEC 61508 (all parts) applying a severity level of at least S2 for the function preventing the risk of unintended DC voltage output.		N/A
7. COMMUNICATIONS			P
7.1	Digital communication between the EV supply equipment and the EV		
	Digital communication is optional for Modes 1, 2 and 3	Shall be checked in final use	N/A
	For Mode 4 the digital communication as described in IEC 61851-24 shall be provided to allow the EV to control the EV supply equipment.		P
7.2	Digital communication between the EV supply equipment and the management system		P
	Telecommunication network or telecommunication port of the EV supply equipment, connected to the telecommunication network, if any, shall comply with the requirements for connection to telecommunication networks according to Clause 6 of IEC 60950-1:2005.		P
8. PROTECTION AGAINST ELECTRIC SHOCK			P
8.1	Degrees of protection against access to hazardous-live-parts		
	The different parts of the EV supply equipment as mentioned shall fulfil the following requirements:		P
	•IP ratings for enclosures shall be at least IPXXC;		P
	•vehicle connector when mated with vehicle inlet: IPXXD;		P
	•plug mated with socket-outlet: IPXXD;		P
	•vehicle connector intended for Mode 1 use, not mated: IPXXD;		N/A
	•vehicle connector intended for Mode 2 use, not mated: IPXXB and fulfilling the following:		N/A
	Minimum opening of the contact equal to the clearance according to IEC 60664-1 considering overvoltage category 2 (e.g. the value given in IEC 60664-1 for 230 V/400 V is 2,5 kV rated impulse voltage withstand that implies 1,5 mm separation of contacts) and inhibits the charging and warns the user in case of welded contact.		N/A
	•vehicle connector and EV socket-outlet intended for Mode 3 use, not mated: IPXXB provided it is associated directly upstream with a mechanical switching device (see also 12.3) and fulfilling one of the following:		P
	a) minimum opening of the contact equal to the clearance according to IEC 60664-1 considering overvoltage category 3 (e.g. the value given in IEC 60664-1 for 230 V/400 V is 4 kV rated impulse voltage withstand that implies at least 3 mm separation of contacts);		P
	b) presence of monitoring of the switching contacts associated with a means to operate another mechanical		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	switching device providing isolating function upstream the above in case of fault of operation of the switching device upstream the accessory;		
	c) presence of shutters on live entry hole of the socket-outlets or connectors for case C.		N/A
8.2	Stored energy		
8.2.1	Disconnection of plug connected EV supply equipment Disconnection of plug connected EV supply equipment	Shall be checked in final use	N/A
	For plug connected EV supply equipment, where the connection pins are accessible after unplugging, one second after disconnecting the standard plug from the standard socket-outlet, the voltage between any combination of accessible contacts of the standard plug shall be less than or equal to 60 V DC or the stored charge available shall be less than 50 µC.		N/A
8.2.2	Loss of supply voltage to permanently connected EV supply equipment	Shall be checked in final use	N/A
	The voltage between power lines or power lines and protective earthing conductor, when measured at the input supply terminals of the EV supply equipment, shall be less than or equal to 60 V DC or the stored energy shall be less than or equal to 0,2 J within 5 seconds after disconnecting the power supply voltage to the EV supply equipment.		N/A
8.3	Fault protection		
	Fault protection shall consist of one or more protective measures as permitted according to IEC 60364-4-41:		N/A
	•automatic disconnection of supply;	Shall be checked in final use	N/A
	•double or reinforced insulation;		N/A
	•electrical separation if limited to the supply of one item of current-using equipment;		N/A
	•extra low-voltage (SELV and PELV).		N/A
	Electric separation is fulfilled if there is one electrically separated circuit for each EV.		N/A
8.4	Protective conductor		
	The protective earthing conductor and the protective conductor shall be of sufficient rating in accordance with requirements of IEC TS 61439-7.		P
	For Modes 1, 2 and 3, a protective earthing conductor shall be provided between the AC supply input earthing terminal of the EV supply equipment and the EV.		P
	Mode 4 EV supply equipment shall provide either:		P
	a) a protective earthing conductor from the input earthing terminal of the AC supply network to the EV or		P
	b) a protective conductor from the EV supply		P
	equipment to the EV if fault protection is based on electric separation.		
	For Modes 3 and 4 permanently connected EV supply equipment, protective earthing conductors shall not be switched.		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
8.5	Residual current protective devices		
	EV supply equipment can have one or more connecting points to supply energy to EVs.		N/A
	Where connecting points can be used simultaneously and are connected to a common input terminal of the EV supply equipment, they shall have individual protection incorporated in the EV supply equipment.		N/A
	If the EV supply equipment has more than one connecting point that cannot be used simultaneously then such connecting points can have common protection devices.		N/A
	EV supply equipment that includes an RCD and that does not use the protective measure of electrical separation shall comply with the following:		P
	•The connecting point of the EV supply equipment shall be protected by an RCD having a rated residual operating current not exceeding 30 mA;		P
	•RCD(s) protecting connecting points shall be at least type A;		P
	•RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 and IEC 62423;		P
	•RCDs shall disconnect all live conductors.		P
	Where the EV supply equipment is equipped with a socket-outlet or vehicle connector for AC use in accordance with IEC 62196 (all parts), protective measures against DC fault current shall be taken. The appropriate measures shall be:		P
	•RCD type B or		P
	•RCD Type A and appropriate equipment that ensures the disconnection of the supply in case of DC fault current above 6 mA.		P
8.6	Safety requirements for signalling circuits between the EV supply equipment and the EV		
	Any circuit for signalling, which extends beyond the EV supply equipment enclosure for connection with the EV (e.g. control pilot circuit), shall be extra low voltage (SELV or PELV) according to IEC 60364-4-41.		N/A
8.7	Isolating transformers		
	Isolating transformers (excluding safety isolating transformers used for signalling) shall comply with the requirements of IEC 61558-1 and		N/A
	IEC 61558-2-4.		
9. CONDUCTIVE ELECTRICAL INTERFACE REQUIREMENTS			P
9.1	General		
	Clause 9 provides a description of the conductive electrical interface requirements.		P
9.2	Functional description of standard accessories		
	Standard accessories used for EV supply equipment shall be in accordance with IEC 60309- 1, IEC 60309-2 or IEC 60884-1 or the national standard.		N/A
	Standard accessories that are intermateable with interfaces described in the IEC 60320 series shall not be used for EV supply equipment.		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Socket-outlets and plugs designed for household and similar use might not be designed for extended current draw or continuous use at maximum rated currents and might be subject to national regulations and standards for supply of energy to an EV.		N/A
9.3	Functional description of the basic interface		
	General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. The basic interface is specified in 6.5 of IEC 62196-1:2014.		P
	The following contacts are indicated:		P
	•up to three phases (L1, L2, L3);		P
	•neutral (N);		P
	•protective conductor (PE);		P
	•control pilot (CP);		P
	•proximity contact (PP).		P
	It may be used either for single-phase or for three- phase or both.		P
	Ratings and requirements for the use of the basic interface shall be in accordance with the requirements specified in IEC 62196-2.		P
9.4	Functional description of the universal interface		
	General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. The universal interface is specified in 6.4 and Table 2 of IEC 62196-1:2014.		N/A
9.5	Functional description of the DC interface		
	General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. The DC interface, configurations and ratings are specified in 6.6 and Table 4 of IEC 62196-1:2014. Ratings and requirements for the use of DC interface shall be in accordance with the requirements specified in IEC 62196-3.		N/A
9.6	Functional description of the combined interface		
	The combined interface is specified in 6.7 and Table 5 of IEC 62196-1:2014. General requirements and ratings shall be in accordance with the requirements specified in IEC 62196-1. Ratings and requirements for the use of the combined interface with alternating current shall be in accordance with the requirements specified in IEC 62196-2. Ratings and requirements for the use of the combined interface with direct current shall be in accordance with the requirements specified in IEC 62196-3.		N/A
9.7	Wiring of the neutral conductor		
	Where accessories according to IEC 62196 are used for three phase supply the neutral conductor shall always be wired to the accessories.		P
	Where accessories according to IEC 62196 are used for single phase supply, the terminals L (L1) and N (Neutral) shall always be wired.		P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
10. REQUIREMENTS FOR ADAPTORS			N/A
	Vehicle adaptors shall not be used to connect a vehicle connector to a vehicle inlet.		N/A
	Adaptors between the EV socket-outlet and the EV plug shall only be used if specifically designated and approved by the vehicle manufacturer or by the EV supply equipment manufacturer and in accordance with national requirements, if any (see 16.2).		N/A
	Such adaptors shall comply with the requirements of this standard, and the other relevant standards governing either the EV plug or EV socket-outlet portions of the adaptor.		N/A
	The adaptors shall be marked to indicate the specific conditions of use allowed by the manufacturer, e.g. IEC 62196 series.		N/A
	Such adaptors shall not allow transitions from one mode to another.		N/A
11. CABLE ASSEMBLY REQUIREMENTS			P
11.1	General		
	The cable assembly shall be provided with a cable that is suitable for the application.		P
	Cable assemblies shall not allow transitions from one mode to another. This does not concern Mode 2 cable assembles that are constructed according to IEC 62752.		P
11.2	Electrical rating		
	For case C, the voltage and current ratings of the cable assembly shall be compatible with the rating of the EV supply equipment.	Shall be checked in final use	N/A
	For accessories requiring current coding according to Annex B and IEC 62196-2, the maximum value of the current coding as indicated in Clause B.2 shall be in accordance with the current rating of the cable assembly.		P
	Cables used with accessories according to IEC 62196-2 for Mode 3 case B, shall have a minimum withstand I^2t value of 75 000 A^2s.		P
11.3	Dielectric withstand characteristics		
	Dielectric withstand characteristics of the cable assembly shall be as indicated for the EV supply equipment in 12.7.		P
	For Class I equipment: between live part and earth with test voltage for Class I equipment;		P
	For Class II equipment: between live part and exposed conductive parts with test voltage for Class II equipment.		N/A
11.4	Construction requirements		
	A cable assembly shall be so constructed that it cannot be used as a cord extension set.		P
	A cable assembly may include one or more cables, which may be in a flexible tube, conduit or wire way.		P
	The cable may be fitted with an earth-connected metal shielding.		N/A
	The cable insulation shall be wear resistant and maintain flexibility over the full temperature range required by the		P

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	classification of the EV supply equipment.		
11.5	Cable dimensions		
	The maximum cable length shall be in accordance with the national codes if any.	Max.5m for CH	P
11.6	Strain relief		
	The strain relief of the cable in the vehicle connector, EV plug or in the standard plug shall be as specified in the relevant product standard (e.g. IEC 62196-1, IEC 60309-1 or IEC 60884-1).		P
	For case C the strain relief at the EV supply equipment shall be in accordance with the requirements in IEC 62196-1.		N/A
11.7	Cable management and storage means for cables assemblies		
	For case C EV supply equipment, a storage means shall be provided for the vehicle connector when not in use.		N/A
	For case C EV supply equipment the lowest point of the vehicle connector when stored shall be located at a height between 0,5 m and 1,5 m above ground level.		N/A
	For case C EV charging stations with cables of more than 7,5 m, a cable management system shall be provided. The free cable length shall not exceed 7,5 m when not in use.		N/A
	Prevention of overheating of cables or cable assemblies used in stored or partially stored position shall be ensured.		N/A
12. EV SUPPLY EQUIPMENT CONSTRUCTIONAL REQUIREMENTS AND TESTS			P
12.1	General		
	The control means and the protection means in Mode 2 EV supply equipment that is intended to be used both as stationary equipment and as portable equipment shall comply with EN IEC 61851-1 and with IEC 62752.		N/A
	For case C EV supply equipment, the output cable assembly is considered part of the assembly for testing purpose.		N/A
	Electric devices and components of EV supply equipment shall comply with their relevant standards. The tests of devices and components shall be carried out with the specimen, or any movable part of it, placed in the most unfavourable position that can occur in normal use.		P
	For extreme environment or other special service conditions, see IEC TS 61439-7.		N/A
12.2	Characteristics of mechanical switching devices		
12.2.1	General		
	Switching devices within EV supply equipment intended to supply the connecting points shall comply with their relevant standards, with at least the characteristics as given in 12.2.		N/A
12.2.2	Switch and switch-disconnector		N/A
	Switches and switch-disconnectors shall comply with IEC 60947-3.		N/A
	For AC applications, switches and switch- disconnectors shall have a rated current, at a utilization category of at		N/A

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	least AC-22A, not less than the rated current of the circuit that they are intended to operate in.		
	For DC applications, switches and switch- disconnectors shall have a rated current, at a utilization category of at least DC-21A, not less than the rated current of the circuit that they are intended to operate in.		N/A
12.2.3	Contactor		N/A
	Contactors shall comply with IEC 60947-4-1.		N/A
	For AC applications, contactors shall have a rated current, at a utilization category of at least AC-1, not less than the rated current of the circuit that they are intended to operate in.		N/A
	For DC applications, contactors shall have a rated current, at a utilization category of at least DC-1, not less than the rated current of the circuit that they are intended to operate in.		N/A
12.2.4	Circuit-breaker		N/A
	Circuit breakers, if any, shall comply with IEC 60898-1 or IEC 60947-2 or IEC 61009-1.		N/A
12.2.5	Relays		N/A
	Relays used to switch the main current path shall comply with IEC 61810-1 with the following minimum characteristics:		N/A
	•50 000 cycles,		N/A
	•contact category: CC 2.		N/A
12.2.6	Inrush current		N/A
	AC EV supply equipment shall withstand the inrush current according to 8.2.2 of ISO 17409:2015.		N/A
	The following values are specified in ISO 17409:		N/A
	•After closing the contactor in the EV supply equipment at the peak value of the supply voltage, the EV supply equipment shall be able to withstand 230 A peak within the duration of 100 µs.		N/A
	•During the next second the EV supply equipment shall be able to withstand 30 A (rms).		N/A
	The protection means shall be selected not to trip for inrush current.		N/A
12.2.7	Residual direct current monitoring device (RDC MD)		N/A
	This will be covered in the future IEC 62955 (under consideration).		N/A
12.3	Clearances and creepage distances		
	The clearances and creepage distances in the EV supply equipment, installed as intended by the manufacturer, shall be in accordance with the requirements specified in IEC 60664-1.		P
	Parts of the EV supply equipment directly connected to the public AC supply network shall be designed according to overvoltage category IV.		N/A
	Permanently connected EV supply equipment shall be designed according to a minimum overvoltage category III except for the socket- outlet or the vehicle connector in		N/A

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	case C where a minimum overvoltage category II applies.		
	EV supply equipment supplied through a cable and plug shall be designed according to a minimum overvoltage category II.		P
	Equipment that is intended to be used under the conditions of a higher overvoltage category shall include appropriate overvoltage protective device (see 4.3.3.6 of IEC 60664-1:2007).		N/A
12.4	IP degrees		
12.4.1	Degrees of protection against solid foreign objects and water for the enclosures		P
	Enclosures of the EV supply equipment shall have an IP degree, according to IEC 60529 as follows:		P
	•indoor use: at least IP41;		P
	•outdoor use: at least IP44.		P
	The minimum IP degree for socket-outlets and the vehicle connectors shall be in accordance with their appropriate standards.		P
	IPX4 may be obtained by the combination of the socket-outlet or connector and the lid or cap, EV supply equipment enclosure or EV enclosure.		P
12.2.4	Degrees of protection against solid foreign objects and water for basic, universal and combined and DC interfaces		P
	The minimum IP degrees for ingress of objects and liquids shall be:		P
	•Indoor use:		P
	– vehicle connector when mated with vehicle inlet: IP21;		P
	– EV plug mated with EV socket-outlet: IP21;		P
	– vehicle connector for case C when not mated: IP21;		N/A
	– vehicle connector for case B when not mated: IP24.		P
	•Outdoor use:		P
	– vehicle connector when mated with vehicle inlet: IP44;		P
	– EV plug mated with EV socket-outlet: IP44;		P
	– vehicle connector when not mated: IP24;		P
	– vehicle connector for case B when not mated: IP24;		P
	– socket-outlet when not mated: IP24.		P
	IPX4 may be obtained by the combination of the socket-outlet or connector and the lid or cap, EV supply equipment enclosure or EV enclosure.		P
12.5	Insulation resistance		
	The insulation resistance measured with a 500 V DC voltage applied between all inputs/outputs connected together (power source included) and the accessible parts shall be:		P
	•for a class I EV supply equipment: R > 1 MΩ;	>100MΩ for all models	P
	•for a class II EV supply equipment: R > 7 MΩ.		N/A
	For this test all extra low voltage (ELV) circuits shall be connected to the accessible parts during the test.		N/A
	The measurement of insulation resistance shall be carried out with the protective impedances disconnected, and after applying the test voltage for the duration of 1 min and		P

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	immediately after the damp heat continuous test of IEC 60068-2-78, test Ca, at 40 °C ± 2 °C and 93 % relative humidity for four days.		
	The conditioning test for the insulation test and the touch current can be avoided if the conditioning for test of 12.9 followed by test of 12.5, 12.6 and final test of 12.9, are conducted sequentially in that order.		N/A
12.6	Touch current		
	The touch current between any AC supply network poles and the accessible metal parts connected with each other, and with a metal foil covering insulated external parts, is measured in accordance with IEC 60990 and shall not exceed the values indicated in Table 1.		N/A
	The touch current shall be measured within one hour after the damp heat continuous test of IEC 60068-2-78, test Ca, at 40 °C± 2 °C and 93% relative humidity for four days, with the electric vehicle charging station connected to AC supply network in accordance with IEC 60990.		N/A
	The test voltage shall be 1,1 times the maximum rated voltage.		N/A
	Table 1 – Touch current limits		N/A
	Between any network poles and the accessible metal parts connected with each other and a metal foil covering insulated external parts:		N/A
	Class I		N/A
	Class II		N/A
	Between any network poles and the metal inaccessible parts normally non- activated (in the case of double insulation):		N/A
	Class I N/A		N/A
	Class II		N/A
	Between inaccessible and accessible parts connected with each other and a metal foil covering insulated external parts (additional insulation):		N/A
	Class I N/A		N/A
	Class II		N/A
	This test shall be made when the EV supply equipment is functioning with a resistive load at rated output power.		N/A
	Circuitry that is connected through a fixed resistance or referenced to earth (for example, proximity function and control pilot function) are disconnected before this test.		N/A
	The equipment is fed through an isolating transformer or installed in such a manner that it is isolated from the earth.		N/A
12.7	Dielectric withstand voltage		
12.7.1	AC withstand voltage		P
	The dielectric withstand voltage, at power frequency of 50 Hz or 60 Hz, shall be applied for 1 min as follows:		P
	1) For a class I EV supply equipment.(Un + 1 200 V) (r.m.s.) in common mode (all circuits in relation to the	Dielectric withstand voltage	P

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	exposed conductive parts) and differential mode (between each electrically independent circuit and all other exposed conductive parts or circuits) as specified in 5.3.3.2 of IEC 60664-1:2007.	of 2000V (r.m.s) had been performed according to EN 62196-1:2014	
	2) For a class II EV supply equipment.2 times (Un +1 200 V) (r.m.s). in common mode (all circuits in relation to the exposed conductive parts) and differential mode (between each electrically independent circuit and all other exposed conductive parts or circuits) as specified in 5.3.3.2.3 of IEC 60664-1:2007.		N/A
	3) For both class I and class II AC EV supply equipment where the insulation between the AC supply network and the extra low voltage circuit is double or reinforced insulation, 2 times (Un + 1 200 V) (r.m.s.) shall be applied to the insulation.		N/A
	Alternatively the test can be carried out using a DC voltage equal to the AC peak values.		N/A
	For this test, all the electrical equipment shall be connected, except those items of apparatus which, according to the relevant specifications, are designed for a lower test voltage; current consuming apparatus (e.g. windings, measuring instruments, voltage surge suppression devices) in which the application of the test voltage would cause the flow of a current, shall be disconnected.		P
	Such apparatus shall be disconnected at one of their terminals unless they are not designed to withstand the full test voltage, in which case all terminals may be disconnected		N/A
12.7.2	Impulse dielectric withstand (1,2 µs/50 µs)		N/A
	The dielectric withstand of the power circuits at impulse test shall be tested according to IEC 60664-1.		N/A
	The impulse voltage shall be applied to live parts and exposed conductive parts.	No exposed conductive parts	N/A
	The test shall be carried out in accordance with the requirements of IEC 61180.		N/A
	Parts of the EV supply equipment directly connected to the public AC supply network shall be tested according to overvoltage category IV.		N/A
	Permanently connected EV supply equipment shall be tested according to an overvoltage category III except for the socket-outlet or the vehicle connector in case C where an overvoltage category II applies.		N/A
	EV supply equipment supplied through a cable and plug shall be tested according to an overvoltage category II.		N/A
12.8	EV supply equipment shall comply with IEC TS 61439-7.	Temperature rise had been evaluated in clause 24 of EN	N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
		62196-1/-2	
	Damp heat functional test		
	Following the conditioning defined below, the EV supply equipment is deemed to pass the test, if, it passes the normal sequences test according to A.4.7 of Annex A. The precision of the timing does not need to be verified.		N/A
12.9	Conditioning:		N/A
	– For indoor units, 6 cycles of 24 h each to a damp heat cycling test according to IEC 60068-2- 30 (Test Db) at (40±3) °C and relative humidity of 95 %;		N/A
	– For outdoor units, two 12 day periods, with each period consisting of 5 cycles of 24 h each to a damp heat cycling test according to IEC 60068-2- 30 (Test Db) at (40±3) °C and relative humidity of 95 %.		N/A
12.10	Minimum temperature functional test		
	The EV supply equipment shall be pre-conditioned in accordance with IEC 60068-2-1, test Ab, at the minimum operating temperature (either -5 °C for indoor, -25 °C outdoor or lower values declared by the manufacturer ± 3 K) for (16 ± 1) h.		N/A
	The EV supply equipment is deemed to pass the test, if, immediately after the preconditioning, it passes the sequences test according to A.4.7 of Annex A while at the minimum operating temperature. The precision of the timing does not need to be verified.		N/A
12.11	Mechanical strength		
	For Mode 2 EV supply equipment the minimum		N/A
	degree of protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262.		
	After the test, the samples shall show that:		N/A
	– the IP degree according to 12.5 is not impaired;		N/A
	– no part has moved, loosened, detached or deformed to the extent that any safety functions are impaired;		N/A
	– the test did not cause a condition that results in the equipment not complying with the strain relief requirements, if applicable;		N/A
	– the test did not result in a reduction of creepage and clearance between uninsulated live parts of opposite polarity, uninsulated live parts and accessible dead or grounded metal below the minimum acceptable values;		N/A
	– the test did not result in any other evidence of damage that could increase the risk of fire or electric shock.		N/A
13. OVERLOAD AND SHORT-CIRCUIT PROTECTION			N/A
13.1	General		
	Where connecting points can be used simultaneously and are intended to be supplied from the same input line, they shall have individual protection incorporated in the EV supply equipment.	Shall be checked in final use	N/A
	If the EV supply equipment presents more than one connecting point then such connecting points may have		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	common overload protection means and may have common short-circuit protection means, if those protection means provide the required protection for each of the connecting points		
	If the EV supply equipment presents more than one connecting point that cannot be used simultaneously then such connecting points can have common protection means.		N/A
	Such overcurrent protective devices shall comply with IEC 60947-2, IEC 60947-6-2 or IEC 61009-1		N/A
	or with the relevant parts of IEC 60898 series or IEC 60269 series.		
13.2	Overload protection of the cable assembly		
	The EV charging stations or Mode 2 EV supply equipment shall provide overload protection for all cases for all intended cable conductor sizes if not		N/A
	provided by the upstream supply network.		
	The overload protection may be provided by a circuit breaker, fuse or combination thereof.		N/A
	If overload protection is provided by a means other than a circuit breaker, fuse or combination thereof, such means shall trip within 1 min if the current exceeds 1,3 times the rated current of the cable assembly.		N/A
13.3	Short-circuit protection of the charging cable		
	The EV charging stations or Mode 2 EV supply equipment shall provide short-circuit current protection for the cable assembly if not provided by the supply network.		N/A
	In case of short-circuit, the value of I2t at the EV socket-outlet of the Mode 3 charging station shall not exceed 75 000 A2s.		N/A
	In case of short-circuit, the value of I2t at the vehicle connector (Case C) of the Mode 3 charging station shall not exceed 80 000 A2s.		N/A
	The real value of the prospective short-circuit current is evaluated at the point where the cable assembly is connected.		N/A
14. AUTOMATIC RECLOSING OF PROTECTIVE DEVICES			N/A
	The automatic or remote reclosing of protective devices after tripping in the EV supply equipment shall only be possible in case the following requirement is fulfilled:		N/A
	•the socket-outlet shall not be mated to a plug. This shall be checked by the EV supply equipment.		N/A
	For automatic or remote reclosing automatic reclosing devices (ARDs) with an assessment means may be used.		N/A
	The EV supply equipment may close the contactor during an automatic or remote reset cycle to establish conductivity between the protection device and the socket-outlet.		N/A
	By this procedure the EV supply equipment can check the circuit up to the socket-outlet to be free of fault current.		N/A
	For case C the EV supply equipment shall not provide		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	automatic or remote reclosing of protective devices.		
15. EMERGENCY SWITCHING OR DISCONNECT (OPTIONAL)			N/A
	Emergency switching or disconnect equipment shall be used either to disconnect the supply network from EV supply equipment or to disconnect the socket-outlet(s) or the cable assembly(ies) from the supply network.		N/A
	Such equipment shall be installed in accordance with national rules.		N/A
	Such equipment may be part of the supply network or either the EV charging station or the Mode 2 supply equipment.		N/A
16. MARKING AND INSTRUCTIONS			P
16.1	Installation manual of EV charging stations		
	The installation manual of EV charging stations shall indicate the classification as given in Clause 5.	Ready for use, no installation needed	N/A
	The EV supply equipment manufacturer shall state the interface characteristics specified in Clause 5 of IEC TS 61439-7:2014 in the manual where applicable.		N/A
	Wiring instructions shall be provided.		N/A
	If protective devices are included in the EV charging station, the manual shall indicate the characteristics of those protection devices explicitly describing the type and rating.		N/A
	If the protective devices are not in the EV charging station, the manual shall indicate all information necessary for the installation of external protection explicitly describing the type and rating of the devices to be used.		N/A
	It is recommended that the installation manual be made available to future customers.		N/A
	If the EV charging station has more than one connection of the equipment to the AC supply network, and does not have individual protection for each connecting point to the vehicles, then the installation manual shall indicate that each connection of the equipment to the AC supply network requires individual protection.		N/A
	The installation manual shall indicate if the optional function for ventilation is supported by the charging station (6.3.2.2).		N/A
	The installation manual shall indicate ratings or other information that denote special (severe or unusual) environmental conditions of use, see 5.3.		N/A
16.2	User manual for EV supply equipment		
	User information shall be provided by the manufacturer on the EV supply equipment or in a user's manual.		P
	Such information shall state:		P
	•which adaptors or conversion adapters are allowed to be used, or		N/A
	•which adaptors or conversion adapters are not allowed to		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	be used, or		
	•that adaptors or conversion adapters are not allowed to be used, and		P
	•that cord extension sets are not allowed to be used.		P
	The user manual shall include information about national usage restrictions.		P
16.3	Marking of EV supply equipment		P
	The EV supply equipment manufacturer shall provide each EV supply equipment with one or more labels, marked in a durable manner and located in a place such that they are visible and legible during installation and maintenance:		P
	a) EV supply equipment manufacturer's name, initials, trade mark or distinctive marking;	See page 3	P
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the EV supply equipment manufacturer;	See page 3	P
	c) “Indoor Use Only", or the equivalent, if intended for indoor use only;		N/A
	The EV supply equipment manufacturer shall provide each EV supply equipment with one or more labels, marked in a durable manner and located in a place such that they are visible and legible during installation:		P
	d) means of identifying date of manufacture;	See page 3	P
	e) type of current;	See page 3	P
	f) frequency and number of phases in case of alternating current;	See page 3	P
	g) rated voltage (input and output if different);	See page 3	P
	h) rated current (input and output if different) and the ambient temperature used to determine the rated current;	See page 3	P
	i) degree of protection;	See page 3	P
	j) all necessary information relating to the special declared classifications, characteristics and diversity factor(s), severe or unusual environmental conditions of use, see 5.3.		N/A
16.4	Marking of charging cable assemblies case B		
	Cable assemblies for Mode 1 Case B or Mode 3 Case B shall be marked in a durable manner with the following information:		P
	a) manufacturer's name or trade mark;	See page 3	P
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the manufacturer;	See page 3	P
	c) rated voltage;	See page 3	P
	d) rated current;	See page 3	P
	e) number of phases.	See page 3	P
	f) degree of protection		
	Marking for the entire cable assembly shall be provided in a clear manner by a label or equivalent means.		P
16.5	Durability test for marking		

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	Marking made by moulding, pressing, engraving or similar, including labels with a laminated plastic covering, shall not be submitted to the following test.	Laser marked on product body	P
	The markings required by this standard shall be legible with corrected vision, durable and visible during use.		P
	After the test, the marking shall be legible to normal or corrected vision without additional magnification. It shall not be easily possible to remove marking plates and they shall show no curling.		P
A. ANNEX A – CONTROL PILOT FUNCTION TROUGH A CONTROL PILOT CIRCUIT USING A PWM SIGNAL AND A CONTROL PILOT WIRE			N/A
A.1	General		
A.2	Control pilot circuit		
A.2.1	General		
	Figures A.1 and A.2 illustrate an electric equivalent circuit of the control pilot circuit. The EV supply equipment shall set the duty cycle of the PWM control pilot signal to indicate the maximum current according to Table A.7.		N/A
	The indicated maximum current transmitted shall not exceed the value according to 6.3.1.6.		N/A
	The EV supply equipment may open the switching device that energizes the EV if the EV draws a higher current than the PWM signal (duty cycle) indicates. In this case, the EV supply equipment shall respect the following conditions:		N/A
	•the allowed response time of the EV, according to Table A.6 (e.g. sequence 6).		N/A
	•the current tolerance related to the duty cycle generated by the EV supply equipment (1 percentage point).		N/A
	•the tolerances of the current measurement used in the EV supply equipment itself.		N/A
	The control pilot circuit shall be designed in accordance with Figures A.1 or A.2 with the values defined in Table A.2, Table A.3 and Table A.4.		N/A
	The functionality of the control pilot circuit shall follow the requirements defined in Table A.4, Table A.6, Table A.7 and Table A.8.		N/A
A.2.2	Typical control pilot circuit (see EN IEC 61851-1:2017)		N/A
	The EV supply equipment communicates by setting the duty cycle of a PWM signal or a continuous DC voltage signal (Table A.7).		N/A
	The EV supply equipment may change the duty cycle of the PWM signal at any time.		N/A
	The EV responds by applying a resistive load to the positive half-wave to the control pilot circuit.		N/A
	For further information about the PWM signal see also Table A.2, Table A.3 and Table A.4.		N/A
	EVs using typical control pilot circuit (Figure A.1) shall be able to create state B and use it according to the sequences specified in Table A.6.		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	EV using a typical control pilot circuit shall determine the maximum current from EV supply equipment from the duty cycle of the PWM signal (Table A.8).		N/A
A.2.3	Simplified control pilot circuit (see EN IEC 61851-1:2017)		N/A
	An EV using the simplified control pilot circuit shall limit itself to single phase charging and shall not draw a current of more than 10 A.		N/A
	EV supply equipment that supports an EV using the simplified control pilot shall modulate the PWM signal in the same manner as done for EVs using the typical control pilot circuit.		N/A
	EVs using simplified control pilot circuit (Figure A.2) are not able to create state B.		N/A
	An EV using the simplified control pilot circuit can measure the duty cycle.		N/A
	The designer of an EV using the simplified control pilot should be aware that the EV supply equipment can open its switching device, if the EV supply equipment indicates less current (by the duty cycle) than the EV draws (see A 2.1).		N/A
	It is not recommended to use the simplified control pilot circuit for new EV design.		N/A
A.2.4	Additional components and high frequency signals		N/A
	Digital communication as described in ISO/IEC 15118 series may be carried out over the control pilot conductor. Additional components can be needed to couple this high-frequency signal onto the control pilot signal.		N/A
	Additional components required for signal coupling shall not deform the control pilot signal beyond the limits defined in Tables A.2 and A.4.		N/A
	The maximum inductance of the control pilot circuit of the EV supply equipment is limited to 1 mH (see Table A.3).		N/A
	The maximum inductance of the control pilot circuit of the EV is limited to 1 mH (see Table A.2).		N/A
	The additional signal for digital communication shall have a frequency of at least 148 kHz.		N/A
	The voltage of the high frequency signal (used for digital communication) shall be in accordance with the values given in Table A.1.		N/A
	One further capacitive (max of 2 000 pF) branch (on the vehicle and on the EV supply equipment) can be used for detection of the high frequency signals, provided the resistance/impedance to ground is higher than 10 kΩ. Such capacitive/resistive branch would typically be used for signal inputs and automatic signal voltage control (refer to Table A.1).		N/A
A.3	Requirements for parameters and system behaviour		
	The control pilot circuit parameters shall be in accordance		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	with Table A.2 and Table A.3 and are shown in Figures A.1 and A.2.		
	EV pilot circuit values and parameters as indicated on Figures A.1 and A.2 are given in Table A.3.		N/A
	Value ranges shall be maintained over full useful life and under design environmental conditions.		N/A
	1 % tolerance resistors are commonly recommended for this application.		N/A
	Table A.4 indicates the pilot voltage range based on components values in Tables A.2 and A.3. It incorporates an increased voltage margin for Va to allow for measurement tolerances of the EV supply equipment.		N/A
	There is no undefined voltage range, for the PWM signal, between the system states.		N/A
	The state is valid if it is within the above values. The state detection shall be noise resistant, e.g. against EMC and high frequency data signals on the control pilot circuit.		N/A
	For reliable detection of a state, it is recommended to apply averaging of the measurement over several milliseconds or PWM cycles.		N/A
	The EV supply equipment shall verify that the EV is properly connected by verifying the presence of the diode in the control pilot circuit, before energizing the system.		N/A
	This shall be done at the transition from x1 to x2 or at least once during state x2, before closing the supply switching device.		N/A
	Presence of the diode is detected if the low side of the PWM-signal is within the voltage range defined in Table A.4.		N/A
	The EV supply equipment shall open or close the supply switching device within the time indicated in Table A.6.		N/A
	Compliance is tested as in Clause A.4.		N/A
	The state changes between A, B, C and D are caused by the EV or by the user.		N/A
	The state changes between state x1 and x2 are created by the EV supply equipment.		N/A
	A change between states x1 and x2 indicates an availability (x2) or unavailability (x1) of power supply to the EV.		N/A
	After changing to state F and while the reason for changing to state F persists, an EV supply equipment with permanently attached cable (case C) shall:		N/A
	– remain in state F, or		N/A
	– remain in state F for at least 300 ms and then change to state x1 (and stays there), in order to detect if an EV is connected.		N/A
	If the failure is not recovered after disconnecting the vehicle connector, the EV supply equipment shall:		N/A
	– remain in or change to state F, or		N/A
	– remain in state x1, if the EV supply equipment provides		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
	an indicator (e.g. a display) which shows “not available”.		
	In the absence of a fault condition in the EV supply equipment, the EV supply equipment shall not use the state F in order to signal that the EV supply equipment will not deliver the energy to the EV. Instead, this shall be done by the state x1.		N/A
	A transition from state E or state F to any other state (x1 or x2) is allowed.		N/A
	If the EV is connected to the EV supply equipment which does not use 5 % duty cycle, and authentication (e.g. RFID identification, payment, etc.) is needed, the control pilot signal shall stay at x1 as long as the energy is not allowed to be supplied.		N/A
	In case, no authentication is needed, the system may go to state x2.		N/A
	In case EV supply equipment requires authentication to supply power, a change from states CX or DX to state BX shall not lead to loss of authentication.		N/A
	This means that no repeated authentication shall be needed.		N/A
	Table A.6 indicates the principle sequences and transitions from one state to another with the timing requirements where applicable. Some transitions that may take place are not indicated in the table.		N/A
	If the EV supply equipment or the EV changes to a new state within the timing indicated for that sequence, the new sequence is initiated and replaces the previous sequence.		N/A
A.4	Test procedures		
A.4.1	General		
A.4.2	Constructional requirements of the EV simulator		P
A.4.3	Test procedure		P
A.4.4	Test List – Oscillator frequency and generator voltage test	(see table 4.4)	P
A.4.5	Duty Cycle test	(see table 4.5)	P
A.4.6	Pulse wave shape test	(see table 4.6)	P
A.4.7	Sequences test	(see table 4.7)	P
A.4.7.1	General		
A.4.7.2	Sequence test using the typical control pilot circuit	(see table 4.7.2)	P
A.4.7.3	Sequence test using the simplified control pilot circuit	(see table 4.7.3)	N/A
A.4.7.4	Optional testing the EV supply equipment that support grid	(see table 4.7.4)	P
A.4.8	Test of interruption of the protective conductor	(see table 4.8)	N/A
A.4.9	Test of short-circuit values of the voltage	(see table 4.9)	P
A.4.10	Example of a test simulator of the vehicle (informative)		N/A
A.4.11	Optional hysteresis test		N/A
A.4.11.1	General		
A.4.11.2	Test sequence for hysteresis between states B and C		N/A
A.4.11.3	Test sequence for hysteresis between states C-E, D-E		N/A
A.4.11.4	Test sequence for hysteresis between states C-D		N/A
A.5	Implementation hints		
A.5.1	Retaining a valid authentication until reaching CP State B		N/A

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Clause	**Requirement + Test**	**Result - Remark**	**Verdict**
A.5.2	Load control using transitions between state x1 and x2		N/A
A.5.3	Information on difficulties encountered with some legacy EVs for wake-up after a long period of inactivity (informative)		N/A

B. ANNEX B – PROXIMITY DETECTION AND CABLE CURRENT CODING CIRCUITS FOR THE BASIC INTERFACE			P
B.1	Circuit diagram for vehicle couplers using an auxiliary switch associated with the proximity detection contact		
	The vehicle couplers using the proximity contact with an auxiliary switch and without current capability coding of the cable assembly shall use the circuit diagram as indicated in Figure B.1 and Table B.1.		N/A
B.2	Circuit for simultaneous proximity detection and current coding		
	Vehicle connectors and plugs using the proximity contact for simultaneous proximity detection and current capability coding of the cable assembly shall have a resistor electrically connected between the proximity contact and the earthing contact (see Figure B.2) with a value as indicated in Table B.2.	See page 7	P
	The resistor shall be coded to the maximum current capability of the cable assembly.		P
	The EV supply equipment shall interrupt the current supply if the current capability of the cable is exceeded as detected by the measurement of the Rc, as specified by the values for the recommended interpretation range in Table B.2.	Shall be checked in final use	N/A
	The EV supply equipment shall detect the current coding by measurement of the Rc, as defined in Table B.2 and use the result to set the value of the maximum allowed current, if necessary, according to 6.3.1.6.	Shall be checked in final use	N/A
	The resistor is also used for proximity detection.	Shall be checked in final use	N/A

4.4	TABLE: Oscillator frequency and generator voltage test					P
State A	Minimum Voltage [V]	Maximum Voltage [V]	Measured Value [V]	Resistor Value [Ω] (EV Simulator)	Oscillator Frequency [Hz] (Req. 1000 Hz +/- 0,5%)	Verdict
	11,4	12,6	--	--	--	--
State B1, B2 / positive	8,62	9,75	--	--	--	--
Negative B	-12,6	-11,4	--	--	--	--
State C1, C2 / positive	5,47	6,53	6.35	878	1005	P
Negative C	-12,6	-11,4	-12.05	878	1005	P

State D1, D2 / positive			--	--	--	--
Negative D	-12,6	-11,4	--	--	--	--
R1	Internal resistor value (1000 Ω +/-3%) [Ω]					
	Calculated: R1_calc(= 2 740 × (U_StateA – U_StateB) / (U_StateB – 0,7)					

4.5	TABLE: Duty cycle test					N/A
Duty cycle	Measured Value [V]	Resistor Value [Ω] (EV Simulator)	Pulse width [µs]	Duty cycle	Indicated current (duty cycle * 0.6)	Verdict
State B /5% Duty cycle	--	--	--	--	--	--
State B / 10% Duty cycle	--	--	--	--	--	--
State B / Max declared / Default Duty cycle	--	--	--	--	--	--

4.6	TABLE: Pulse wave shape test						P
Project	Measured Voltagea	Maximum rise time	Measured Value	Maximum fall time	Measured Value	Duty Cycle	Verdict
	[V]	[µs]	[µs]	[µs]	Measured Value [µs]	Duty Cycle [%]	Verdict
State B1, B2 / positive	9.18	10	8.9	13	11.5	5	P
State C1, C2 / positive	6.02	7	5.4	13	10.3	5	P
State D1, D2 / positive	3.2	5	3.8	13	6.9	5	P
a with nominal resistance values							

4.7.2	TABLE: Sequence test using the typical control pilot circuit											P
Sequence	1.1	3.1	4	7	8.1	4	6	7	8.1	2.1	9.3	
	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	Verdict
Test 1 / Max resistance	4699	1754	454	4699	1754	454	1911	930	146	1911	930	P
Test 2 /Max resistance + HF voltage	12.6V	10	-11	7	-11	7	-11	10	-11	13	-11	P

Test 3 /Min resistance	4607	1725	453	4607	1725	453	1869	910	142	1869	910	P
Test 4 /Min resistance +HF voltage	11	8	-13	5	-13	5	-13	8	-13	11	-13	P

4.7.4	TABLE: Optional testing the EV supply equipment that support grid											
Sequence	1.1	3.1	4	9.1	10.1	8.2	3.1	4	7	8.1	2.1	9.3
	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]	[s]
Nominal resistance values	4613	1726	451	4613	1720	445	1867	906	137	1867	906	140

4.8	TABLE: Test of interruption of the protective conductor		P
	Measured cut off time [ms]	Max. cut off time [ms]	Verdict
State C or D → earth wire open	63	100	P

4.9	TABLE: Test of short circuit values of the voltage	N/A
	Shutdown time [s]	Verdict
State C + 120Ω resistance	2.2	P

Appendix 1: Additional requirements for EV Plug and EV Connector according to IEC/EN 62196-1/2			
Clause	Requirement + Test	Result - Remark	Verdict
8	**MARKING**		
Sequence	Covered by clause 16 of EN EN IEC 61851-1		N/A
9	**DIMENSIONS**		
Sequence	Certified Plug and Connector		P
10	**PROTECTION AGAINST ELECTRIC SHOCK**		
Sequence	Certified Plug and Connector		P
11	**SIZE AND COLOUR OF PROTECTIVE EARTHING CONDUCTORS**		
Sequence	Certified Plug and Connector		P
12	**PROVISION FOR EARTHING**		
Sequence	Certified Plug and Connector		P
13	**TERMINALS**		
Sequence	Certified Plug and Connector		P
14	**INTERLOCKS**		
Sequence	Certified Connector		P
15	**RESISTANCE TO AGEING OF RUBBER AND THERMOPLASTIC MATERIAL**		
Sequence	Certified Plug and Connector		P
16	**GENERAL CONSTRUCTION**		
Sequence	Certified Plug and Connector		P
17	**CONSTRUCTION OF SOCKET-OUTLETS**		
Sequence	Certified Plug and Connector		P
18	**CONSTRUCTION OF PLUG AND VEHICLE CONNECTORS**		
Sequence	Certified Plug and Connector		P
19	**CONSTRUCTION OF VEHICLE INLETS**		
Sequence	Certified Plug and Connector		P
20	**DEGREE OF PROTECTION**		
Sequence	Certified Plug and Connector		P
21	**INSULATION RESISTANCE AND DIELECTRIC STRENGTH**		
Sequence	Certified Plug and Connector		P

22	BREAKING CAPACITY		
	Certified Plug and Connector		P

Appendix 1: Additional requirements for EV Plug and EV Connector according to IEC/EN 62196-1/2			
Clause	Requirement + Test	Result - Remark	Verdict
23	**NORMAL OPERATION**		
	Certified Plug and Connector		P
24	**TEMPERATURE RISE**		
	Certified Plug and Connector		P
25	**FLEXIBLE CABLES AND THEIR CONNECTION**		
	Certified Plug and Connector		P
26	**MECHANICAL STRENGTH**		
	Certified Plug and Connector		P
27	**SCREWS, CURRENT CARRYING PARTS AND CONNECTIONS**		
	Certified Plug and Connector		P
28	**CREEPAGE DISTANCES, CLEARANCES AND DISTANCE**		
	Certified Plug and Connector		P
29	**RESISTANCE TO HEAT, TO FIRE AND TO TRACKING**		
	Certified Plug and Connector		P
30	**CORROSION AND RESISTANCE TO RUSTING**		
	Certified Plug and Connector		P
31	**CONDITIONAL SHORT-CIRCUIT CURRENT WITHSTAND TEST**		
	Certified Plug		P
32	**ELECTROMAGNETC COMPATIBILITY**		N/A
33	**VEHICLE DRIVEOVER**		
	Certified Plug and Connector		P
201	**Components (IEC 62196-2)**		
	Certified Plug and Connector		P
202	**Resistor coding** (IEC 62196-2)		
	Certified Plug and Connector		P

TABLE: Critical components information

Object / part No.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity 1)
Enclosure	Interchangeable	PC	--	IEC 61851	Tested with appliance
PCB	Interchangeable	Interchangeable	130℃,V-0	DIN EN 60695-11-10; EN 60695-11-10	VDE
Connector	Ningbo JYRS New Energy Technology Co.,Ltd.	JY-IEC-32FSP	250V 32A	IEC 62196-1/2	TUV 11112608 67
EV-Cables (Charging Cables for Electric Vehicles)	Ningbo JYRS New Energy Technology Co.,Ltd.	EVC H07BZ5-F	3G 6.0mm^2 +1×0.75mm^2 450/750V	EN 50620	CE

1) Provided evidence ensures the agreed level of compliance. See OD-2039.

--End of Report--