TEST REPORT

Product Name:	AC home EV charger
Brand Name:	EVwallbox
Model Number:	FE-AM3-32P3mini, FE-AM3-32mini, FE-AM3-16P3mini
Prepared For:	Changzhou Fisher Electonic Technology Co.,Ltd.
Address:	NO.211 Jincheng Road,Jincheng Town,Jintan District,Changzhou City
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Date of Receipt:	2023-07-16
Test Date:	2023-07-16 to 2023-07-21
Date of Report:	2023-07-31
Report No.:	DL-20230720002S

TEST REPORT
EN 61851-1: 2019
Electric vehicle conductive charging system
Part 1: General requirements

Report Number. ..... :	DL-20230720002S
Date of issue ..... :	2023-07-31
Total number of pages ..... :	41 pages
Name of Testing Laboratory preparing the Report ..... :	Shenzhen DL Testing Technology Co., Ltd.
Applicant's name ..... :	Changzhou Fisher Electonic Technology Co.,Ltd.
Address ..... :	NO.211 Jincheng Road,Jincheng Town,Jintan District, Changzhou City
Test specification:	
Standard ..... :	EN IEC 61851-1:2019
Test procedure ..... :	Test report
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC61851_1B
Test Report Form(s) Originator .... :	VDE Prüf- und Zertifizierungsinstitut GmbH
Master TRF ..... :	Dated 2018-02-19

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Test item description ..... :	AC home EV charger
Trade Mark ..... :	EVwallbox
Manufacturer ..... :	Changzhou Fisher Electonic Technology Co.,Ltd. NO.211 Jincheng Road,Jincheng Town,Jintan District, Changzhou City
Model/Type reference ..... :	FE-AM3-32P3mini, FE-AM3-32mini, FE-AM3-16P3mini
Ratings ..... :	Input: 415Va.c. (3P+N+PE)32A 50-60Hz Output: 415Va.c. (3P+N+PE)32A 50-60Hz

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	Shenzhen DL Testing Technology Co., Ltd.	
Testing location/ address .....:		101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China	
Tested by (name, function, signature).....:		Nick Cheng	Nick Cheng
Approved by (name, function, signature) ..:		Jade Yang	Jade Yang
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature) ..:			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address .....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature) ..:			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address .....:			
Tested by (name, function, signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature) ..:			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment): 1. Photos (5 page)	
Tests performed (name of test and test clause): The submitted samples were tested and found to comply with the requirements of: EN IEC 61851-1:2019	**Testing location:** 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Summary of compliance with National Differences (List of countries addressed): N/A ☒ **The product fulfils the requirements of** EN IEC 61851-1:2019	

Copy of marking plate:
The artwork below may be only a draft.

AC home EV charger
Model: FE-AM3-32P3mini
Input: 415Va.c. (3P+N+PE) 32A 50-60Hz
Output: 415Va.c. (3P+N+PE) 32A 50-60Hz

Manufacturer: Changzhou Fisher Electonic Technology Co.,Ltd.
Address: NO.211 Jincheng Road,Jincheng Town,Jintan District, Changzhou City
Importer: XXXX
Address: XXXX

Test item particulars..... :	
Equipment mobility..... :	☒ movable ☐ hand-held ☐ transportable ☐ stationary ☐ for building-in ☐ direct plug-in
Connection to the mains..... :	☒ pluggable equipment ☐ type A ☒ type B ☐ permanent connection ☐ detachable power supply cord ☐ non-detachable power supply cord ☐ not directly connected to the mains
EV charging modes ..... :	☐ Mode 1 charging ☐ Mode 2 charging ☐ Mode 3 charging ☒ Mode 4 charging
Type of EV connection..... :	☐ Case A ☐ Case B ☒ Case C
Access location ..... :	☒ operator accessible ☐ service access area ☐ restricted access location
Over voltage category (OVC) ..... :	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV ☐ other:
Mains supply tolerance (%) or absolute mains supply values ..... :	±15%
Tested for IT power systems ..... :	☐ Yes ☒ No
IT testing, phase-phase voltage (V) ..... :	N/A
Class of equipment ..... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Considered current rating (A) ..... :	100A(for one phase)
Pollution degree (PD) ..... :	☐ PD 1 ☐ PD 2 ☒ PD 3
IP protection class ..... :	IP20
Altitude during operation (m) ..... :	<2000
Altitude of test laboratory (m) ..... :	<200
Mass of equipment (kg) ..... :	
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 .....:	2023-07-16
Date (s) of performance of tests.....:	2023-07-16 to 2023-07-21

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.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) ..... :	Changzhou Fisher Electonic Technology Co.,Ltd. NO.211 Jincheng Road,Jincheng Town,Jintan District,Changzhou City
General product information and other remarks: All models are the same, except model name and colour.	

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.		N/A
5	**CLASSIFICATION**		**P**
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;		N/A
	– 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 EV supply equipment delivers:		P
	– AC EV supply equipment;		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– 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;		N/A
	– outdoor use.		P
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.		P
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;		P
	– equipment for locations with non-restricted access.		N/A
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.		P
	– pole/column/pipe-mounted		N/A
	– floor mounted		N/A
	– ground mounted.		P
	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		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	according to 6.2:		
	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**		—
	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
	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		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	equipment to the EV.		
	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 conductor or protective conductor to the vehicle connector.		N/A
6.3	**Functions provided in Mode 2, 3 and 4**		—
6.3.1	**Mandatory functions in Modes 2, 3, and 4**		P
6.3.1.1	**General**		P
	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
	If EV supply equipment can supply more than one vehicle simultaneously, it shall ensure that the 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.		P
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

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
	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.		N/A
	The EV supply equipment shall disconnect the supply to the EV in case of:		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**		P
	If the control pilot signal is interrupted the power supply to the EV shall be interrupted according to 6.3.1.2.		P
	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 operation.		P
6.3.1.6	**Maximum allowable current**		P
	A means shall be provided to inform the EV of the value of the maximum current it		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	is allowed to draw. The value of the maximum current permitted shall be transmitted and shall not exceed any of the following:		
	•the rated output current of the EV supply equipment,		P
	•the rated current of the cable assembly.	32A	P
	The transmitted value may change, without exceeding the maximum allowed current, to adapt to power limitations, e.g. for load management.		P
	The EV supply equipment may interrupt the energy supply if the current drawn by the EV exceeds the transmitted value.		P
6.3.2	**Optional functions for Modes 2, 3 and 4**		P
6.3.2.1	**General**		P
	The optional functions that are implemented shall be indicated in the manual and shall fulfil the requirements of 6.3.2.		P
6.3.2.2	**Ventilation during supply of energy**		P
	EV supply equipment can exchange information with installation regarding the request and presence for ventilation.		P
6.3.2.3	**Intentional and unintentional disconnection of the vehicle connector and/or the EV plug**		P
	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.		P
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

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 combined connector having separate contacts for AC or DC charging.		N/A
	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		P
	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.		N/A
7.2	**Digital communication between the EV supply equipment and the management system**		—
	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.		N/A
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;		N/A
	•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		N/A

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		
	•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 switching device providing isolating function upstream the above in case of fault of operation of the switching device upstream the accessory;		P
	c) presence of shutters on live entry hole of the socket-outlets or connectors for case C.		P
8.2	**Stored energy**		—
8.2.1	**Disconnection of plug connected EV supply equipment Disconnection of plug connected EV supply equipment**		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**		P
	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.		P
8.3	**Fault protection**		—
	Fault protection shall consist of one or more protective measures as permitted according to IEC 60364-4-41:		P
	•automatic disconnection of supply;		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•double or reinforced insulation;		P
	•electrical separation if limited to the supply of one item of current-using equipment;		P
	•extra low-voltage (SELV and PELV).		P
	Electric separation is fulfilled if there is one electrically separated circuit for each EV.		P
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:		N/A
	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 equipment to the EV if fault protection is based on electric separation.		P
	For Modes 3 and 4 permanently connected EV supply equipment, protective earthing conductors shall not be switched.		P
8.5	**Residual current protective devices**		—
	EV supply equipment can have one or more connecting points to supply energy to EVs.		P
	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.		P
	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:		N/A
	•The connecting point of the EV supply equipment shall be protected by an RCD having a rated residual operating current not exceeding 30 mA;		N/A
	•RCD(s) protecting connecting points shall be at least type A;		N/A
	•RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 and IEC 62423;		N/A

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•RCDs shall disconnect all live conductors.		N/A
	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:		N/A
	•RCD type B or		N/A
	•RCD Type A and appropriate equipment that ensures the disconnection of the supply in case of DC fault current above 6 mA.		N/A
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 IEC 61558-2-4.		N/A
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.		P
	Standard accessories that are intermateable with interfaces described in the IEC 60320 series shall not be used for EV supply equipment.		P
	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

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•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.		P
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.		P
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.		N/A
10	**REQUIREMENTS FOR ADAPTORS**		N/A
	Vehicle adaptors shall not be used to connect a vehicle connector to a vehicle inlet.		N/A

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
	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.		N/A
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		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	cannot be used as a cord extension set.		
	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.		P
	The cable insulation shall be wear resistant and maintain flexibility over the full temperature range required by the classification of the EV supply equipment.		P
11.5	**Cable dimensions**		—
	The maximum cable length shall be in accordance with the national codes if any.		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.		P
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.		P
	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.		P
	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.		P
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 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.		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 least AC-22A, not less than the rated current of the circuit that they are intended to operate in.		N/A
	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**		P
	Relays used to switch the main current path shall comply with IEC 61810-1 with the following minimum characteristics:		P
	•50 000 cycles,		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•contact category: CC 2.		P
12.2.6	**Inrush current**		P
	AC EV supply equipment shall withstand the inrush current according to 8.2.2 of ISO 17409:2015.		P
	The following values are specified in ISO 17409:		P
	•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.		P
	•During the next second the EV supply equipment shall be able to withstand 30 A (rms).		P
	The protection means shall be selected not to trip for inrush current.		P
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.		P
	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 case C where a minimum overvoltage category II applies.		N/A
	EV supply equipment supplied through a cable and plug shall be designed according to a minimum overvoltage category II.		N/A
	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;		N/A

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	•outdoor use: at least IP44.	IP65	P
	The minimum IP degree for socket-outlets and the vehicle connectors shall be in accordance with their appropriate standards.		N/A
	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.		N/A
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:		N/A
	– vehicle connector when mated with vehicle inlet: IP21;		N/A
	– EV plug mated with EV socket-outlet: IP21;		N/A
	– vehicle connector for case C when not mated: IP21;		N/A
	– vehicle connector for case B when not mated: IP24.		N/A
	•Outdoor use:		P
	– vehicle connector when mated with vehicle inlet: IP44;		P
	– EV plug mated with EV socket-outlet: IP44;		N/A
	– vehicle connector when not mated: IP24;		P
	– vehicle connector for case B when not mated: IP24;		N/A
	– socket-outlet when not mated: IP24.		N/A
	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.		N/A
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;		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.		P
	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 immediately after the damp heat continuous test of IEC 60068-2-78, test		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
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.		P
	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.		P
	The test voltage shall be 1,1 times the maximum rated voltage.		P
	Table 1 – Touch current limits		P
	Between any network poles and the accessible metal parts connected with each other and a metal foil covering insulated external parts:		P
	Class I 3,5 mA		P
	Class II 0,25 mA		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 3,5 mA		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 0,5 mA		N/A
	This test shall be made when the EV supply equipment is functioning with a resistive load at rated output power.		P
	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.		P
	The equipment is fed through an isolating transformer or installed in such a manner that it is isolated from the earth.		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
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 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.		P
	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.		P
	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		P
12.7.2	**Impulse dielectric withstand (1,2 µs/50 µs)**		P
	The dielectric withstand of the power circuits at impulse test shall be tested according to IEC 60664-1.		P
	The impulse voltage shall be applied to live parts and exposed conductive parts.		P
	The test shall be carried out in accordance with the requirements of IEC 61180.		P
	Parts of the EV supply equipment directly connected to the public AC supply network shall be tested according to overvoltage category IV.		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.**		—
12.9	**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.		P
	Conditioning:		P
	– 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 %.		P
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.		P
	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.		P
12.11	**Mechanical strength**		—
	For Mode 2 EV supply equipment the minimum degree of protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262.		P
	After the test, the samples shall show that:		P
	– the IP degree according to 12.5 is not impaired;		P
	– no part has moved, loosened, detached or deformed to the extent that any safety functions are impaired;		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– the test did not cause a condition that results in the equipment not complying with the strain relief requirements, if applicable;		P
	– 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;		P
	– the test did not result in any other evidence of damage that could increase the risk of fire or electric shock.		P
13	**OVERLOAD AND SHORT-CIRCUIT PROTECTION**		P
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.		P
	If the EV supply equipment presents more than one connecting point then such connecting points may have 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		P
	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 or with the relevant parts of IEC 60898 series or IEC 60269 series.		P
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 provided by the upstream supply network.		N/A
	The overload protection may be provided by a circuit breaker, fuse or combination thereof.		P
	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.		P
13.3	**Short-circuit protection of the charging cable**		—
	The EV charging stations or Mode 2 EV supply equipment shall provide short-circuit current		N/A

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	protection for the cable assembly if not provided by the supply network.		
	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.		P
14	**AUTOMATIC RECLOSING OF PROTECTIVE DEVICES**		P
	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:		P
	•the socket-outlet shall not be mated to a plug. This shall be checked by the EV supply equipment.		P
	For automatic or remote reclosing automatic reclosing devices (ARDs) with an assessment means may be used.		P
	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 automatic or remote reclosing of protective devices.		N/A
15	**EMERGENCY SWITCHING OR DISCONNECT (OPTIONAL)**		P
	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.		P
	Such equipment shall be installed in accordance with national rules.		P
	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.		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
	Wiring instructions shall be provided.		P
	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.		P
	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.		P
	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).		P
	The installation manual shall indicate ratings or other information that denote special (severe or unusual) environmental conditions of use, see 5.3.		P
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 be used, or		N/A
	•that adaptors or conversion adapters are not allowed to be used, and		N/A
	•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		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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:		
	a) EV supply equipment manufacturer's name, initials, trade mark or distinctive marking;		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;		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;		P
	e) type of current;		P
	f) frequency and number of phases in case of alternating current;		P
	g) rated voltage (input and output if different);		P
	h) rated current (input and output if different) and the ambient temperature used to determine the rated current;		P
	i) degree of protection;		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.		P
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:		N/A
	a) manufacturer's name or trade mark;		N/A
	b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the manufacturer;		N/A
	c) rated voltage;		N/A
	d) rated current;		N/A
	e) number of phases. f) degree of protection		N/A
	Marking for the entire cable assembly shall be provided in a clear manner by a label or equivalent means.		N/A
16.5	**Durability test for marking**		—
	Marking made by moulding, pressing, engraving or similar, including labels with a laminated plastic covering, shall not be submitted to the following		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	test.		
	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**		P
A.1	**General**		—
A.2	**Control pilot circuit**		—
A.2.1	**General**		P
	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.		P
	The indicated maximum current transmitted shall not exceed the value according to 6.3.1.6.		P
	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:		P
	•the allowed response time of the EV, according to Table A.6 (e.g. sequence 6).		P
	•the current tolerance related to the duty cycle generated by the EV supply equipment (1 percentage point).		P
	•the tolerances of the current measurement used in the EV supply equipment itself.		P
	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.		P
	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.		P
A.2.2	**Typical control pilot circuit (see IEC 61851-1:2017)**		P
	The EV supply equipment communicates by setting the duty cycle of a PWM signal or a continuous DC voltage signal (Table A.7).		P
	The EV supply equipment may change the duty cycle of the PWM signal at any time.		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The EV responds by applying a resistive load to the positive half-wave to the control pilot circuit.		P
	For further information about the PWM signal see also Table A.2, Table A.3 and Table A.4.		P
	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.		P
	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).		P
A.2.3	**Simplified control pilot circuit (see 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

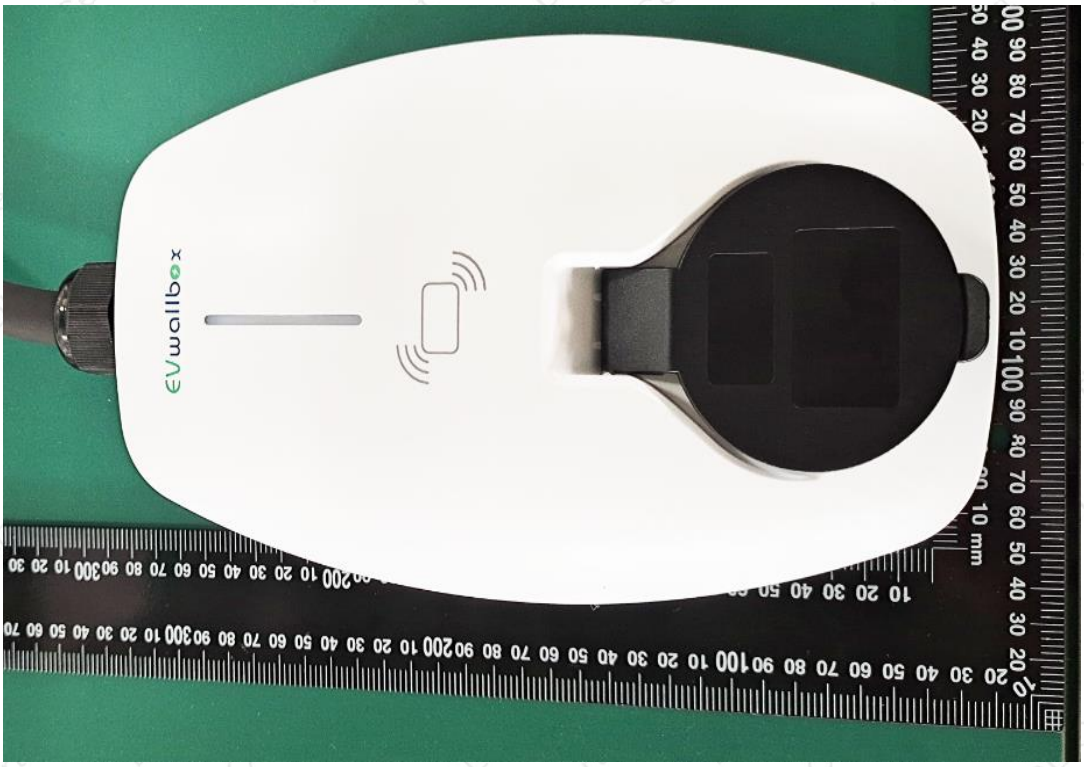
EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The additional signal for digital communication shall have a frequency of at least 148 kHz.		N/A
	The voltage of the high frequency signal (used for digital communication) shall be in accordance with the values given in Table A.1.		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 with Table A.2 and Table A.3 and are shown in Figures A.1 and A.2.		N/A
	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		N/A

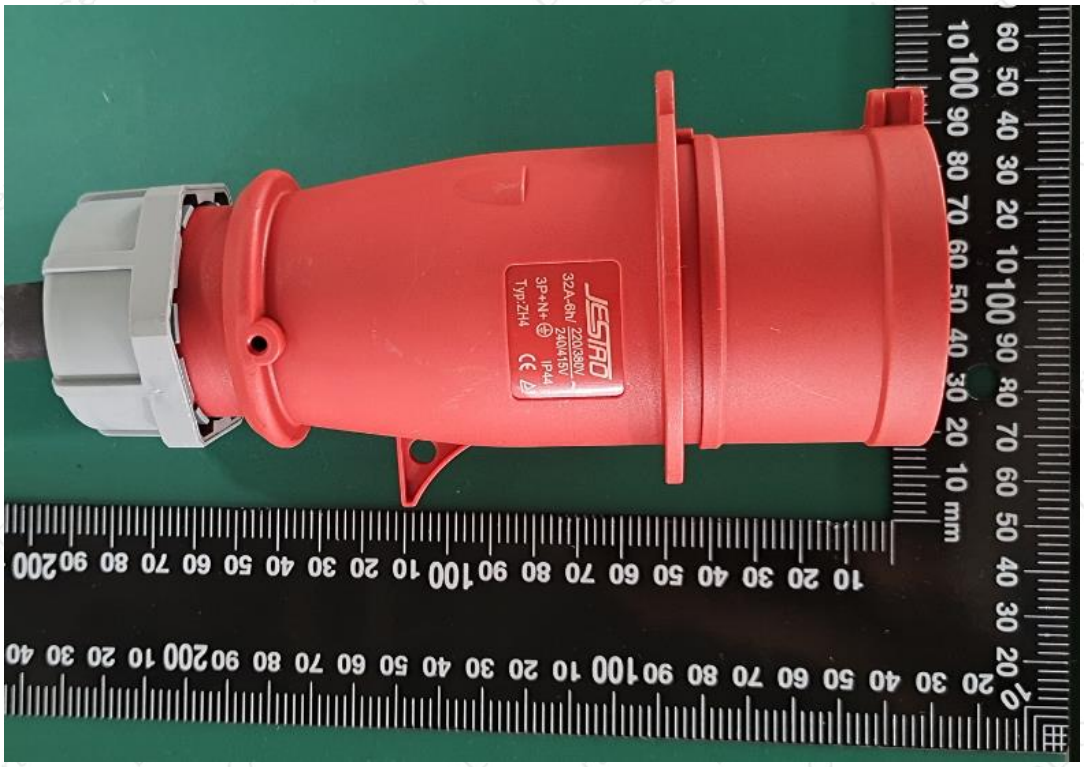
EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	defined in Table A.4.		
	The EV supply equipment shall open or close the supply switching device within the time indicated in Table A.6.		N/A
	Compliance is tested as in Clause A.4.		N/A
	The state changes between A, B, C and D are 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:		P
	– remain in state F, or		P
	– 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.		P
	If the failure is not recovered after disconnecting the vehicle connector, the EV supply equipment shall:		P
	– remain in or change to state F, or		P
	– remain in state x1, if the EV supply equipment provides an indicator (e.g. a display) which shows “not available”.		P
	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.		P
	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.		P
	This means that no repeated authentication shall be needed.		P
	Table A.6 indicates the principle sequences and		N/A

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
	transitions from one state to another with the timing requirements where applicable. Some transitions that may take place are not indicated in the table.		
	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**		P
A.4.5	**Duty Cycle test**		P
A.4.6	**Pulse wave shape test**		P
A.4.7	**Sequences test**		P
A.4.7.1	**General**		P
A.4.7.2	**Sequence test using the typical control pilot circuit**		P
A.4.7.3	**Sequence test using the simplified control pilot circuit**		P
A.4.7.4	**Optional testing the EV supply equipment that support grid**		P
A.4.8	**Test of interruption of the protective conductor**		P
A.4.9	**Test of short-circuit values of the voltage**		P
A.4.10	**Example of a test simulator of the vehicle (informative)**		P
A.4.11	**Optional hysteresis test**		P
A.4.11.1	**General**		P
A.4.11.2	**Test sequence for hysteresis between states B and C**		P
A.4.11.3	**Test sequence for hysteresis between states C-E, D-E**		P
A.4.11.4	**Test sequence for hysteresis between states C-D**		P
A.5	**Implementation hints**		—
A.5.1	**Retaining a valid authentication until reaching CP State B**		P
A.5.2	**Load control using transitions between state x1 and x2**		P

EN IEC 61851-1			
Clause	Requirement + Test	Result - Remark	Verdict
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.		P
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.		P
	The resistor shall be coded to the maximum current capability of the cable assembly.		N/A
	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.		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.		P
	The resistor is also used for proximity detection.		N/A

Photo:

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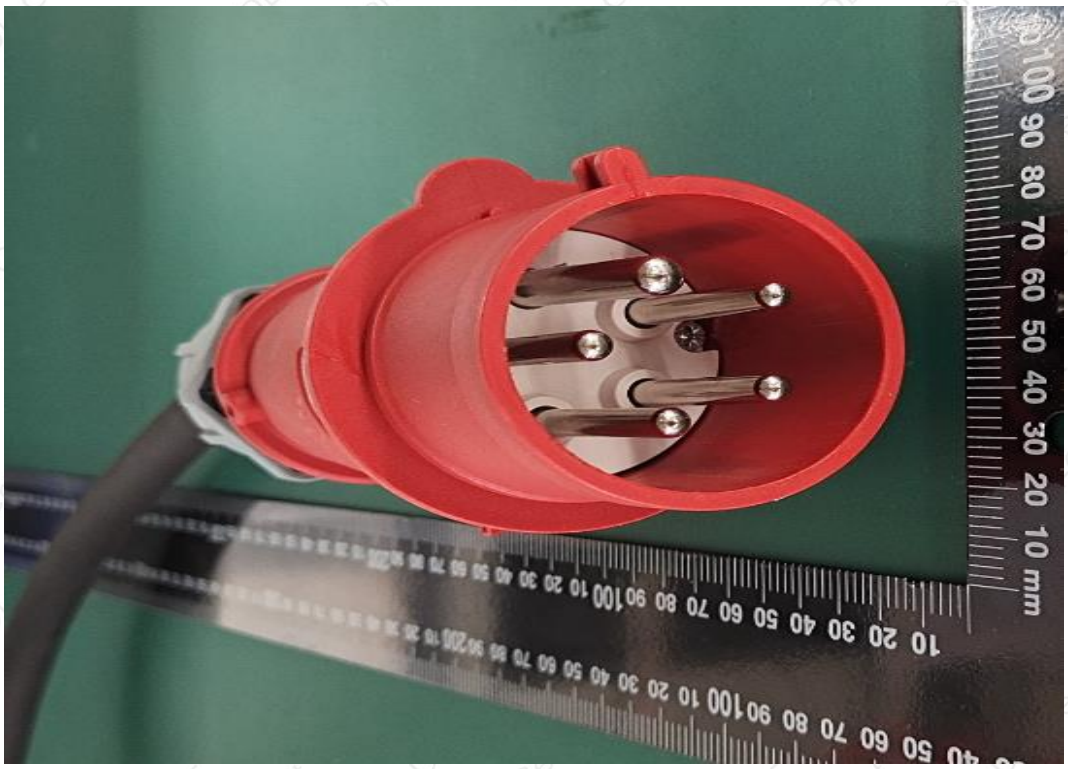
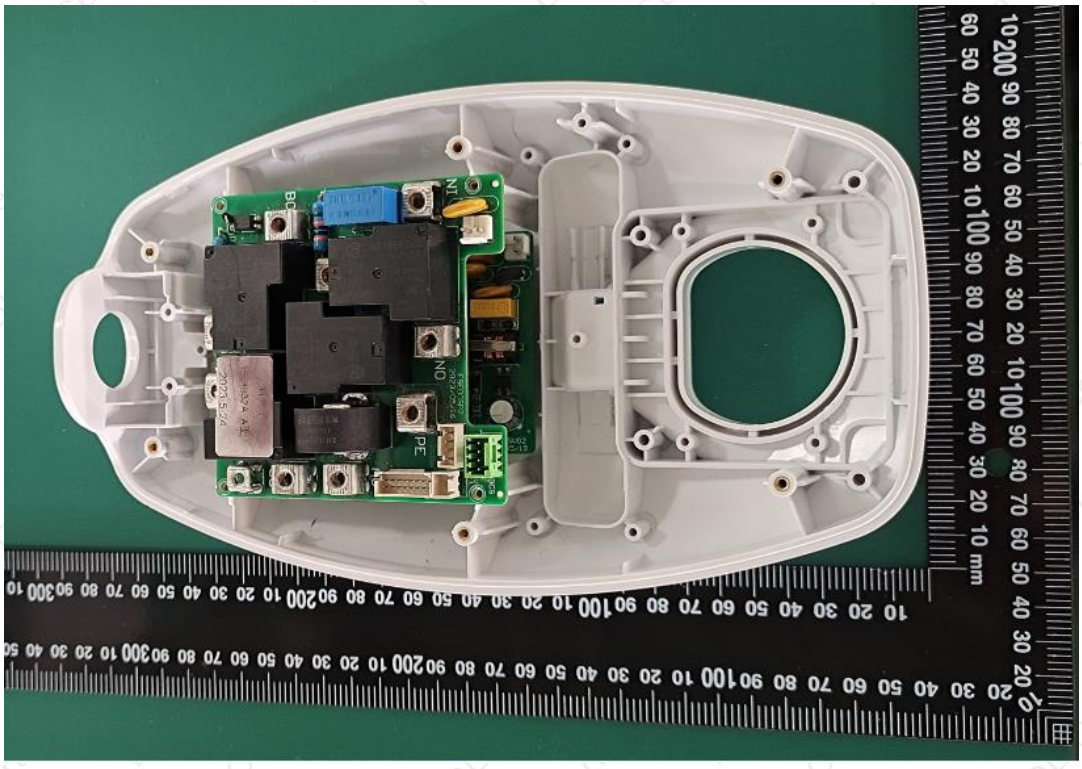
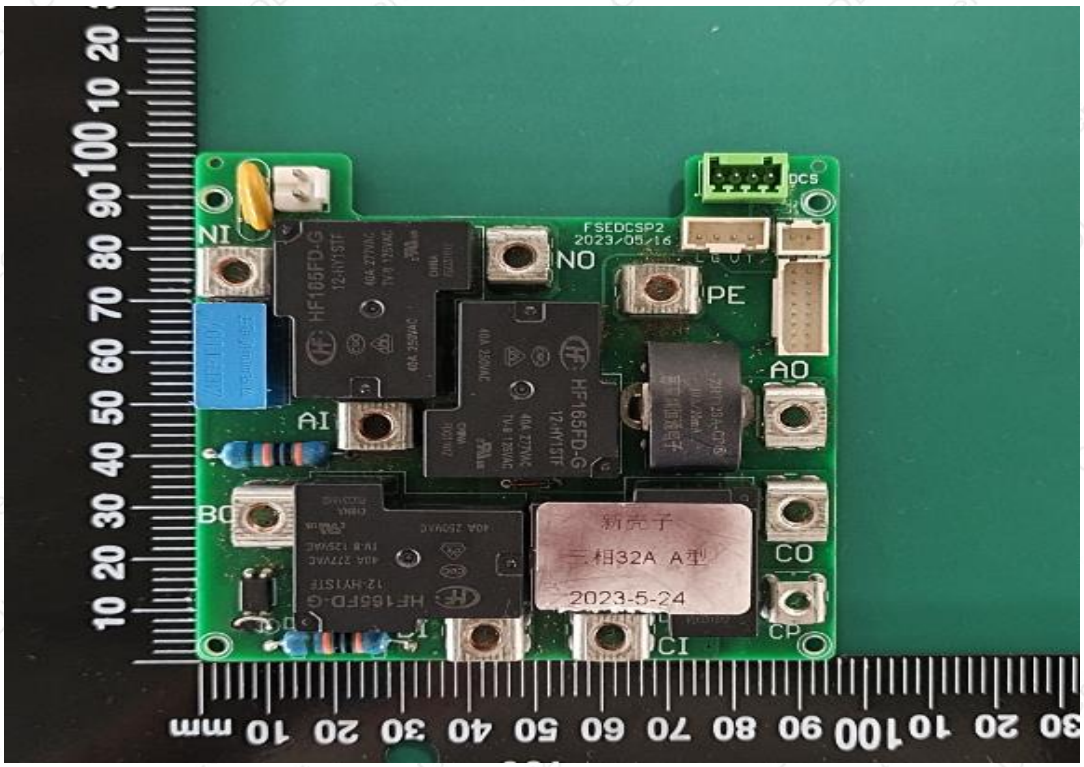
Typ:ZH4



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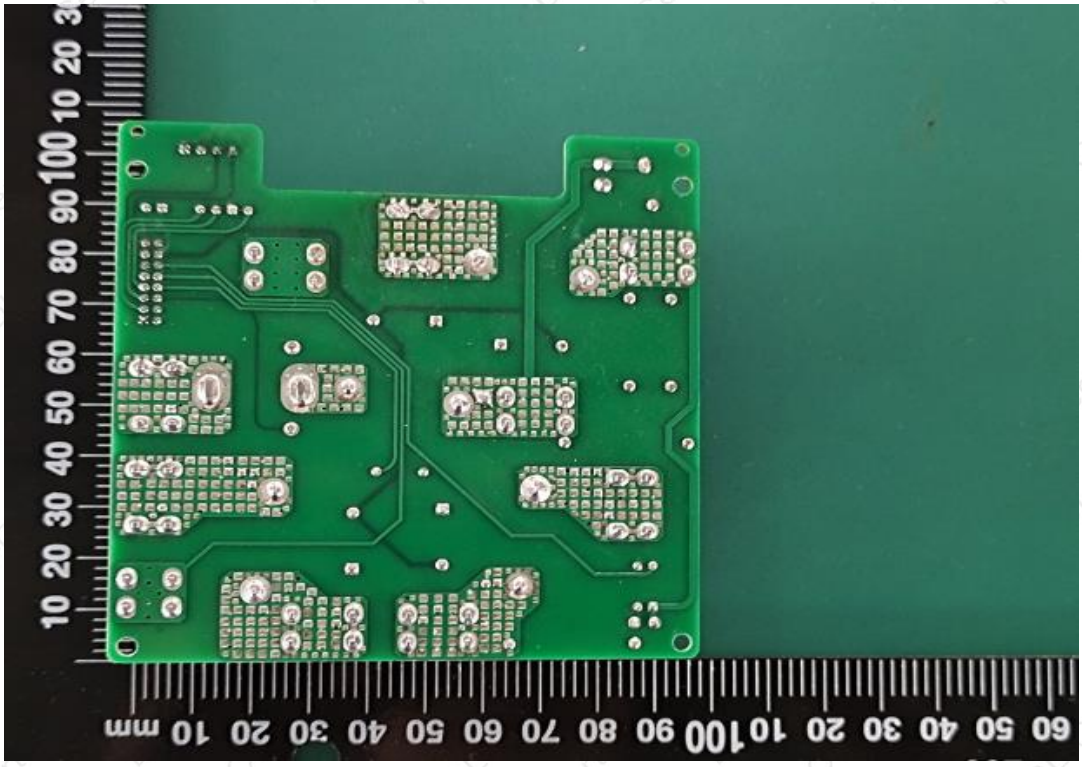

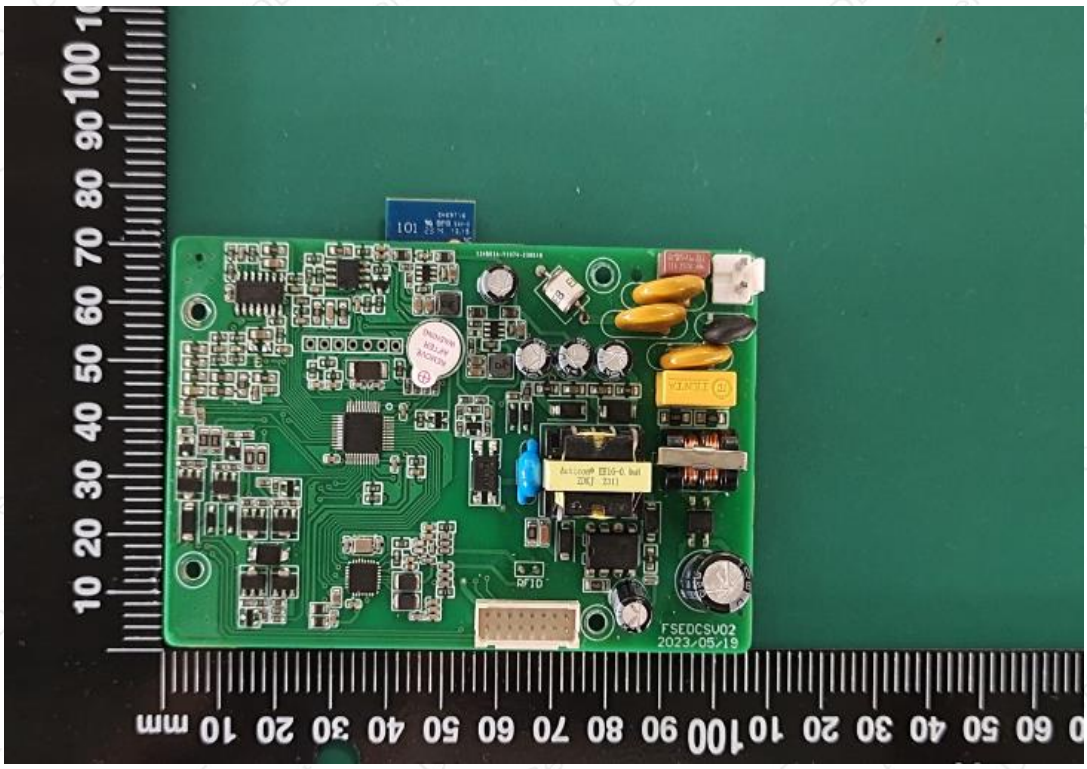

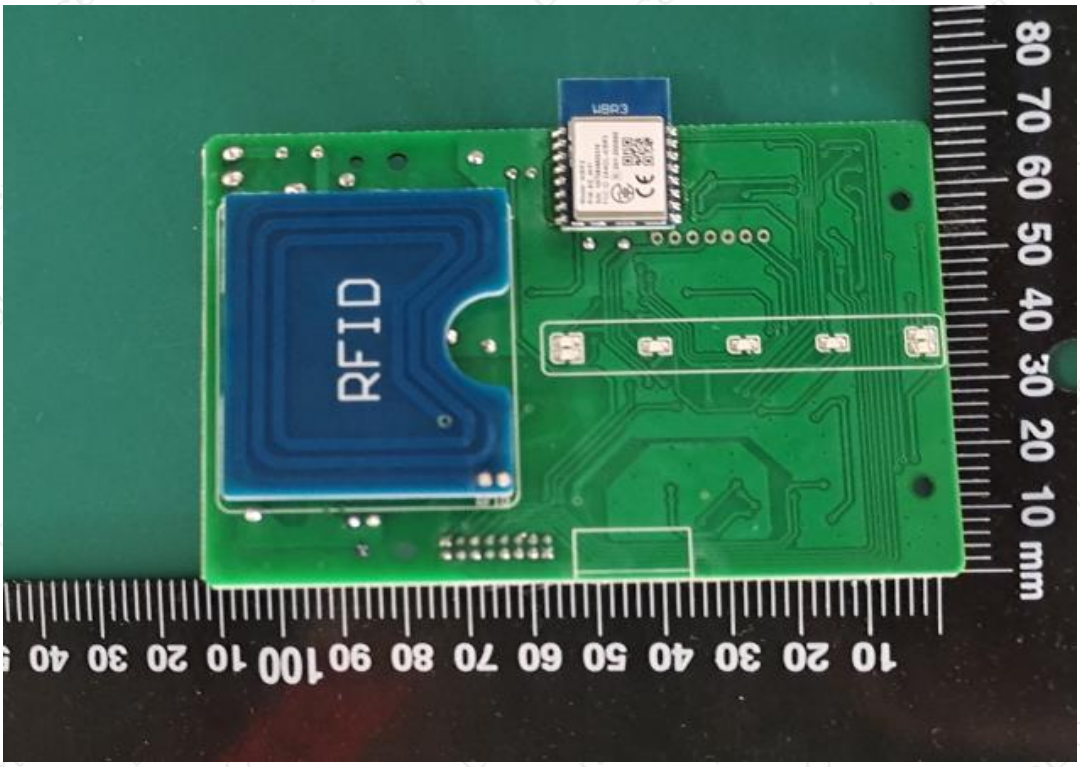

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